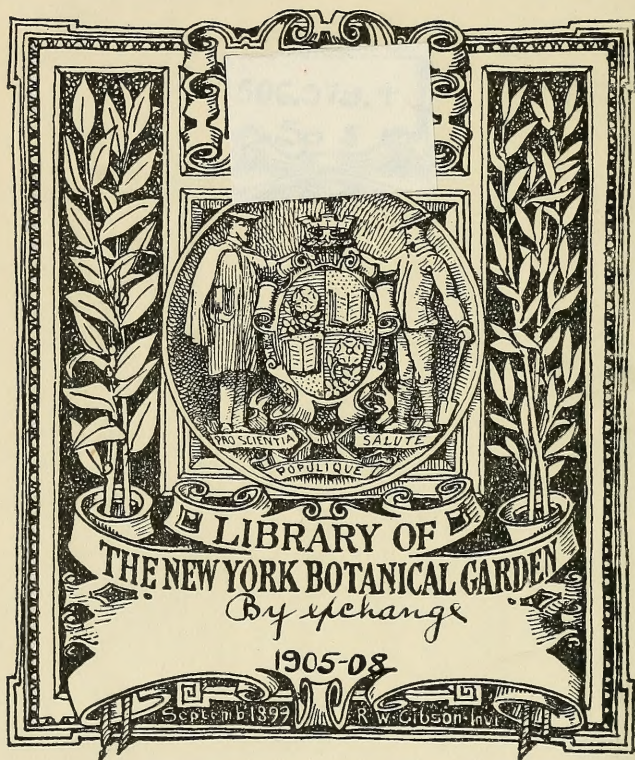




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BULLETIN

OF THE

Southern California Academy of Sciences

COMMITTEE ON PUBLICATION

THEO. B. COMSTOCK, S. D.; A. DAVIDSON, C. M., M. D.; WM. H. KNIGHT.

CONTENTS:

	Page	Page
Congratulations (Editorial).....	1	The Bees of Southern California—VII
Transactions for December, 1904.....	2	by T. D. A. Cockerell.....
Academy, Directors.....	2	Prehistoric California by Dr Lorenzo
Sections, Biology.....	2	Gordin Yates.....
Astronomy.....	3	Notes and News.....
Botany, Geology.....	4	Flora of Clifton, Arizona—II, by
Publications Received.....	4	A. Davidson, C. M., M. D.....
Publications Reviewed.....	5	
A Preliminary Synopsis of the South-		
ern California Cyperaceae—VI, by		
S. B. Parish.....	8	

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CONGRATULATIONS?

We are pleased to note that our cautionary remarks last month against over-exertion in the cause of the Academy have been heeded by the present members. So far as can be judged by results, no one has run serious risk from overwork in enlisting recruits. The membership list has grown some through the efforts of members of the Board of Directors, but the fact remains that the Southern California Academy of Sciences, with all its valuable work for the community and the advancement of science, is still dependent upon the sacrifices and generosity of a very few devoted workers.

Notwithstanding the advantage gained this year by the free use of excellent quarters for our meetings, we lack vital sustenance to enable us to properly put forth the results of the scientific labors of the best local authorities, which are freely offered.

Just now the Committee on Publication has in hand a considerable amount of material which it would be disgraceful not to publish under the auspices of the Academy. But the limit of funds available compels us to let it go elsewhere, unless by some means enough money can be raised to meet the mere cost of printing.

TRANSACTIONS FOR DECEMBER, 1904.**I. ACADEMY SESSION.**

At the regular monthly meeting of the Academy, held Monday evening, December 5, at the State Normal School, President Dozier presided.

The Secretary, Mr. B. R. Baumgardt, delivered a lecture on "The Grand Canon of the Colorado," illustrated by the lantern, with slides from photographs taken largely by himself and Mrs. Baumgardt, and colored by the latter.

Disclaiming any attempt to fully discuss the geologic and dynamic causes of the canon topography, the lecturer introduced a graphic explanation of the marvelous erosive and transportative power of moving water. The picture illustrations, with his lucid and eloquent descriptions, brought clearly to view the extent and character of the work done by the Colorado in rock-sculpture and denudation under the peculiar conditions prevailing in its track. This collection of slides is particularly interesting from its comprehensive character and its delineation of both the details of structure and their massing in broad prospective. More than usual in similar exhibitions, the very difficult feat of presenting the idea of distance and real proportion was accomplished. Vivid portrayal of the facts by word-pictures left a memorable impress of reality, due to the intimate contact of the speaker with his subject in the field.

EDITOR.

II. DIRECTORS' MEETING.

The Board of Directors met in the State Normal School Building, January 3, 1905. Meeting was called to order by President Dozier. In the absence of the regular Secretary, C. A. Whiting was appointed Secretary pro tem. Present: The President, Dr. Comstock, Mr. Taber, Mr. Parsons and C. A. Whiting. On motion, Dr. Julius Koebig was elected a member of the Academy. The janitor's bill for three dollars, for the month of December, 1904, was presented and allowed. On motion, the chair appointed a committee consisting of Dr. Comstock, Mr. Knight and Mr. Baumgardt to recommend members of the Academy to the Board of Directors for election to Fellowships.

C. A. WHITING, Secretary Pro Tem.

III. MEETINGS OF SECTIONS.**1. Section of Biology.**

Regular monthly meeting, held at the State Normal School, Monday evening, December 12. The minutes of previous meeting were read and approved. A pamphlet on "The Study of Certain Hybrid Fishes" was shown by the chairman, Professor A. B. Ulrey, who made a few remarks upon its contents. Mr. G. Major Taber presented some newspaper clippings on the "Effects of Light on Pain", and on the "Color of Body Rays". A guarded discussion followed.

Professor Joseph Grinnell, of Throop Institute, delivered the lecture of the evening, on "Mammalian Ecology." Questions were freely asked and answered and discussion was free throughout. Skins and skulls of various mammals were used to illustrate the various changes in animals of like species under varying conditions.

Dr. Leonard was announced as the lecturer at the succeeding (January) meeting on the subject of "City Bacteriological Work."

Owing to the absence of the Secretary, these minutes were taken by Mr. F. C. Clark.

C. A. WHITING, Secretary.

2. Section of Astronomy.

December 19th, Section met at usual hour, Chairman Knight presiding.

The meeting was opened with instructive remarks by the Chairman relative to the increase in the number of double stars that have been discovered, giving credit to many and notable discoveries at the Lick Observatory; justifying very amply the generous appropriations made for the maintenance of that noble institution.

Mr. Knight then gave a resume of the knowledge now systematized relative to Phoebe, the ninth satellite of Saturn; claiming for it a diameter of about a thousand miles, a radius of revolution of about two million miles, and a period of perhaps three weeks. It is claimed by some that this planet moves about its principal in a direction reverse to that of the other satellites, but this theory is not fully accepted by the astronomical world. The question gave rise to a spirited discussion.

The Chairman then introduced the speaker of the evening, Mr. B. R. Baumgardt, who entertained the section first by reference to some of the interesting facts relative to Encke's comet. The period of the comet is 3 1/3 years, its orbit being an ellipse; and its present situation is in the vicinity of Mercury. Mr. Baumgardt claims that there is no good authority for the theory that any comet of the solar system goes beyond the orbit of Jupiter. He stated that any comet which moves at a greater rate than twenty-six miles per second never returns, and must move in a hyperbolic or parabolic course; that all apparently parabolic or hyperbolic comets may be but such as move in ellipses of extreme eccentricity, the remote focus being almost at an infinite distance from the sun; all such comets may yet return to our solar system.

Mr. Baumgardt then proceeded to read a paper delivered at Cambridge by Professor Poynting, on solar radiation. The article consisted chiefly in the discussion of the significance of the fact that a black surface radiates more heat than any other. The author analyzed the heating power of the sun, claiming for it the function of a full radiator.

Professor Turner, of the Oxford Observatory, claims that the highest heating power of the sun at its surface cannot exceed eight thousand degrees. Professor Poynting treated at length the effect of radiant energy as opposed in its effects to the gravitation of the sun, claiming that were the planets small enough the repelling power of the sun's radiant energy would counter-balance the attraction of gravity, or even overcome it. The paper was full of striking statements and closely logical argument, largely opposed to some formerly generally accepted theories.

Mr. Knight read a brief extract from Professor Woodward suggesting the probability that light, heat, electricity, and magnetism would all be proved to be but forms of matter rather than modes of motion.

Remarks were also made touching the extreme importance of the solar observatory being constructed on Mt. Wilson. The eyes of the astronomical world are fixed with intense interest upon the possibilities to be expected from the operation of this newest enterprise for astronomical investigation.

Attention of the Section was called to the interesting occultation of Aldebaran by the moon on the evening of the 20th of December.

After some further discussion, the meeting adjourned.

MELVILLE DOZIER, Secretary.

3. Section of Botany.

Meeting held Thursday evening, December 20, at office of Dr. A. Davidson, who presided. The Chairman read a paper on the "California Palm," with notes and correspondence relative to the probable age of the palms on San Fernando street, Los Angeles.

COLTON RUSSELL, Secretary.

4. Section of Geology.

[The date of meeting (Dec. 24) falling on Christmas Eve., no session of this Section was held in this month.]

PUBLICATIONS RECEIVED.

U. S. Dept. of Agriculture, Washington, 1904.

Bureau of Chemistry. Circular No. 20. Report of Committee on Recommendations of Referees. Bull. No. 88. The Chemical Composition of Apples and Cider. By Wm. B. Atwood, R. J. Davidson and W. A. Moncure.

Bureau of Animal Industry. Circular No. 56. Facts Concerning the History, Commerce and Manufacture of Butter. By Henry Haywood, M. S. Bull. No. 62. The Relation of Bacteria to the Flavors of Cheddar Cheese. By Lore A. Rogers.

Bureau of Soils. Bull. No. 24. The Centrifugal Method of Mechanical Soil Analysis. By Lyman J. Briggs, F. O. Martin and J. R. Pearse.

Thirty-first Annual Report of the Fruit Growers' Association of Ontario.

Tenth Annual Report of the Fruit Experiment Stations of Ontario.

Muhlenbergia, Vol. I, No. 5. Suggestions to Importers of Food Products. U. S. Dept. Agriculture. Chemistry Bull. No. 18.

"Contributions to Cytological Technique," by W. J. V. Osterhout. University of Cal. Botany, Vol. II, No. 2.

"The North American Species of Hymenoxys," by T. D. A. Cockereil. Reprint, Torrey Bull. No. 31.

Ontario Agricultural College. Bull. No. 136. Some Bacterial Diseases of Plants Prevalent in Ontario. By F. C. Harrison and B. Barlow. Bull. No. 137. A Bacterial Disease of Cauliflower and Allied Plants. By F. C. Harrison.

Maine Agricultural Experiment Station. Bull. No. 108. Nov., 1904. Brown-Tail Moth and Other Orchard Moths. By Edith M. Patch.

University of Tennessee Agricultural Exper. Sta. Vol. XVII, No. 3, July, 1904. Training and Pruning Fruit Trees and Vines. By Chas. A. Keffer. Vol. XVII, No. 4, Oct., 1904. Replacing Grain and Alfalfa in a Ration for Dairy Cows. By Andres M. Soule and Samuel E. Barnes.

Trans. Mass. Hort. Society for the year 1904. Part I. Boston, 1904. Annals of the Carnegie Museum, Pittsburgh. Vol. III, No. 1, December-1904.

Mining Magazine, Chicago, San Francisco, London. Vol. XI, No. 1, January, 1905.

American Journal of Archaeology (2d series), Vol. VIII, No. 4, Oct.-Dec., 1904. Supplement to Vol. VIII, 1904. Annual Reports, 1904.

Recent Seismological Investigations in Japan. By Baron Dairoke Kikuchi, Emeritus Professor of Mathematics, Tokyo Imperial University.

PUBLICATIONS REVIEWED.

Californian Polemoniaceae. By Jessie Milliken. Univ. Cal. Publ. Botany 2, 1-71. t. 1-11. May, 1904.

Miss Milliken has taken in hand a family of plants abundantly represented in the flora of the state, so that it has a particular interest to Californian botanists, and they especially will appreciate the convenience of having, under one cover, descriptions of the older species and of these more recently proposed. Six genera are recognized, namely: *Polemonium*, with 6 species; *Navarrettia*, with 32; *Gilia*, with 36; *Linanthus*, with 31; and *Phlox*, with 9 species. In generic distinctions the stress is laid on characters drawn from the calyx. Few new species are proposed, these from the southern counties being *Gilia traskiae*, from Santa Catalina Island; *G. davyi*, common in the Mojave Desert, and *Linanthus pacificus*, from Palomar. Field students will note with satisfaction the reduction of *Gilia floccosa* and *G. filifolia* to varieties of *G. virgata*, and the suppression of *Linanthus pharmaceoides*. The reduction of *L. brevicula* to a variety of *L. androsacea* appears to be less happy. Three species of Southern California—*Gilia bella*, *G. leptantha*, and *G. tenuifolia*—have escaped the author's notice. *Gilia jonesii* is credited to Lower California, "and probably within our borders". The type was collected at Needles. *Gilia setorissima* is cited only from Arizona, "and will therefore probably be found in the desert region of Southern California". The plant is by no means rare in the Mojave desert, where it has been collected by several botanists. The common form is that having punctate corollas, which is figured and described in the Death Valley Report, as variety *punctata*. Oversights such as these are to be regretted in a paper otherwise commendable.

S. B. P.

Circular No. 20, Bureau of Chemistry, U. S. Dept. Agric., is an extract from proceedings of the Association of Official Agricultural Chemists. It is gratifying to learn that chemists have finally awakened to the crying need of uniformity in reporting analytical results. A vast amount of immensely valuable and painstaking work has been all but wasted because of the great labor necessary to put the results into shape for ready comparison. A committee of five has been appointed "to consider the whole question of unifying the terms in which analytical results are reported." The Committee on Recommendations of Referees have carefully gone over in detail the methods of analysis and other suggestions made to them, embodying their conclusions in a paper which has been published in the form of this circular.

The Chemical Composition of Apples and Cider has undoubtedly more to do with a wide range of questions physical, chemical, biological, social, political, industrial and even moral and intellectual, than will appear at first glance. These matters are not considered in the Bulletin before us, but they are suggested by the variations in composition of many samples of cider analyzed and by varying results of fermentation in different varieties of apples under a considerable range of treatment in fermentation. In commercial samples of cider tested "the fluctuations in sugar content from nothing to 13.56 per cent, and in alcohol content from nothing to 6.87 per cent", indicate very loose and ignorant notions among producers of what actually constitutes a true cider. The researches now under way in the Department of Agriculture at Washington are but a beginning of those contemplated, which are to include physical and cultural and other investigations. Eventually it is hoped that adequate knowledge upon these subjects may enable fruit growers to

intelligently breed, cultivate and utilize the nation's important apple crop in a more scientific manner than has heretofore been regarded as among attainable results.

The Centrifugal Method of Mechanical Soil Analysis, as minutely described and discussed in comparison with other methods in use, has interest just now from the claim of certain members of the Association of Official Agricultural Chemists that the plan pursued by the Bureau of Soils of the Agricultural Department does not yield equivalent results to those obtained by the analytic process used at the several Experiment Stations. No real settlement of the controversy appears imminent; but the Association has appointed a committee "to consider the matter and to consult with the Secretary of Agriculture with a view to bringing about greater harmony", etc.

Recent papers of the Bureau of Animal Industry have developed interesting facts relating to the production of butter and cheese, the results of investigation being too technical to present understandingly in limited space.

The Ontario Agricultural College has been doing good work in the study of obscure causes of some plant diseases. The destructive pear blight, for instance, has been credited to no less than fourteen sources by different writers. Dr. T. J. Burrill, of the University of Illinois, did thorough work in 1878, proving that bacteria were responsible for the ravages of the blight. Later, Dr. J. C. Arthur, Botanist of the N. Y. Experiment Station, confirmed this fact and isolated the Bacterium amyloverum as the sole cause. The Bacteriological Department of Ontario Agricultural College has worked out the development of a bean blight, due to another bacterium, and still other Bacteriums have been found responsible for soft rots of cabbage, cauliflower, celery and turnips. Very complete investigation of the cauliflower disease at Toronto by Mr. F. C. Harrison, has yielded results of vast importance. Certain varieties are immune and preventive measures have been devised. The papers are well illustrated.

Bulletin No. 108 of the Maine Agricultural Experiment Station sounds a note of warning against the Brown-tail moth, which has obtained foothold in that State. We quote from a glowing red circular issued by Chas. D. Woods, Director:

"Since it can readily be fought in orchards the danger to them is not so great as to the forests and to the health of citizens. The poisonous effects of the hairs are worse than "ivy" poisoning. If the pests become established their presence will tend to diminish the number of summer visitors to the State, destroy our hard wood forests, and threaten our fruit industries."

Perhaps one who begrudges the dime which it costs an average taxpayer to support the whole scientific work of the government, may realize from this statement how much intrinsic value is sure to ensue from his trifling investment, even to his individual benefit.

The two late Bulletins of the University of Tennessee Agricultural Experiment Station are examples of applied science, but both are valuable. The issue for July is a concise, fully illustrated treatise on the pruning and training of trees and vines, giving practical instructions, with a clear statement of the rationale of the advice given.

Part I, Transactions Mass. Horticultural Society, 1904, is something like the suggestion of its title, but very much more than this. The speech of its President-elect, Dr. Henry P. Walcott, informs us that the society celebrates its seventy-fifth year of remarkable usefulness. Its indirect accomplishments, which have given to Boston many exemplary institutions, make a proud record and evince a kind of public spirit much needed hereabouts. Among the dozen papers of interest and value in

this volume, several deserve wide circulation and careful reading. Mrs. Cora S. Stuart Jones, of Roxbury, contributes a very strong article on "Practical Nature Study for the Public Schools". The important work performed by the Arnold Arboretum is clearly portrayed by John G. Jack, Jamaica Plain. Hints on the culture of Orchids, by Wm. N. Craig, North Easton, is well written. Dr. G. P. Clinton, New Haven, presents a succinct history of "The Study of Parasitic Fungi in the United States". "The Protection of Native Plants", by Robert T. Jackson, Cambridge, also merits more attention than our space permits. The gladiolus and peonies are treated by authorities and the volume closes with a long and fully illustrated paper by Robert T. Jackson, on "John Richardson; His House and Garden". Of these, the author remarks: "He was a rare old man, it was a rare old house, and a rare old garden," etc., and the text and engravings fully bear out the statement.

Annals of the Pittsburgh Carnegie Museum, Vol. III, No. 1, Dec., 1904, contains four valuable papers, besides interesting notes of progress in museum work. The death of Mr. J. B. Hatcher, who had charge of the Department of Paleontology, is a serious loss to science, as well as to the Museum. A quaint historical document is the "Minute or Order Book of the Court for Ohio Co., Virginia," at Black's Cabin (now West Liberty, W. Va.) from 1777 until 1780, the period just before the end of Virginia's jurisdiction over a part of Pennsylvania. Two articles on Paleontology, well illustrated, are furnished by Percy E. Raymond and O. P. Hay, the former on "The Tropidoleptus Fauna at Canandaigua Lake, N. Y.," the other "On Two Species of Turtles From the Judith River Beds of Montana". The closing paper is by P. Modestus Wirtner, giving "A Preliminary List of the Hemiptera of Western Pennsylvania".

Mining Magazine for January has a good array of timely articles. A sketch of John Hays Hammond, with portrait, by Dr. Leonard Waldo, is followed by Robt. H. Postlethwaite's contribution on "Gold Dredging and Prospecting", which is a fair review of the subject, well illustrated. C. W. Purington treats of "The Saving of Alluvial Gold in Alaska and the Klondike." Emile Guarini reviews "German Electrical Installations for Mine Drainage and Ventilation". Waldemar Lindgren briefly outlines the working of the "Deep Leads of Victoria". Dr. H. Bradley, Jr., likewise presents "Mining in Bolivia", and Enrique Laroza "Gold and Copper Mining in Peru". All these papers are from authorities and the illustrations are excellent, much better than in earlier issues of the Magazine. The Mining Digest this month is very full, covering thirty-five pages.

A valuable and interesting monograph is Baron Kikuchi's quarto publication (for private circulation only) which has come to us through the esteemed courtesy of the Japanese Imperial Commissioner at the World's Fair, St. Louis. From it we learn that nearly 1,400 earthquakes are recorded annually in Japan, averaging one each week in Tokyo alone. But, in a circular accompanying the volume, Professor Kikuchi asserts that "only once or twice a year at most, do people in Tokyo have occasion to feel even temporary and slight alarm, and yet Tokyo is the most disturbed region of Japan". It is simple justice to say that one cannot do justice to this important scientific contribution within the limits here prescribed. It is a clear, methodical, and eminently readable treatise, well and lavishly illustrated, and should open the eyes of such as dream that Japan is dreaming in the realm of the constructive and inductive sciences. We consider this brilliant publication a model well worthy of emulation in its literary quality and its orderly presentation of well digested information.

A PRELIMINARY SYNOPSIS OF THE SOUTHERN CALIFORNIA CYPERACEAE.—VI.*

BY S. B. PARISH.

++++ *Involucral leaves several, grass-like.*= *Spikelets large, in an umbel of 1-3 short rays, or condensed in a sessile cluster.*

- ✓ 6. **Scirpus Pacificus**, n. sp., Britton, in lit. **S. maritimus**, Wats., Bot. Cal. 2:218. **S. robustus**, Jepson, Fl. W. Mid. Cal. 87. Abrams, Fl. Los Angeles'', 69.

Culms scabrid above, 3-6 dm. tall; leaves rough-margined, 3-10 mm. wide, the longest equaling the culms; involucral leaves 2-5, one of them erect, and 10-15 cm. long; spikelets ovoid, obtuse, 10-15 mm. long, 3-6 mm. thick; scales brown, puberulous, ovate, 5-7 mm. long, the mid-vein excurrent from the toothed apex as a short, recurved awn; bristles 1-5, weak, shorter than the achene; stamens 3, the anthers tipped with a subulate appendage; achenes brown, obovoid; cuneate-narrowed to the base, mucronulate, 3 mm. long.

Common in brackish water near the seacoast. Long Beach; Davidson, Parish. Redondo; Grant. Los Angeles; Brauntton, Nevin. Coyote Creek; Parish. Also at Camp Cady, in the Mojave Desert; Parish. Apparently not occurring in the Interior subregion. Northward along the Pacific coast to Washington. **S. robustus compactus**, Davy in Jepson, l. c., is simply the condensed form.

☞ *Plate X. Umbel x 2/3. a. Achene x 5. b. Cross section of achene.*

= *Spikelets small, numerous, in a diffuse, decompound umbel.*

- ✓ 7. **Scirpus microcarpus**, Presl, Rel. Haenk. 1:195. Britton, Trans. N. Y. Acad. 11:81. Britt. & Br. Ill. Fl. 1:269. **S. sylvaticus digynus**, Boeckl, Linnaea 36:727. Watson, Bot. Cal. 2:219.

Culms obtusely 3-angled, 1-2 m. tall; leaves rough-margined, 1-2 mm. wide, longer than the culms; involucral leaves unequal, the longest seldom surpassing the rays; primary rays of the umbel numerous, 10-15 cm. long; spikelets obovoid, 3-5 mm. long, in ultimate clusters of 2-7; scales pale brown, obovate, 1-2 mm. long, the green midvein often projecting as a short mucro; bristles 4, mostly twice the length of the achene; stamens 2, the anthers ciliolate on the edges, and tipped with a short conical appendage; achenes nearly white, obovoid, 1 mm. long and nearly as broad, pointed at the apex.

Common along the borders of streams throughout the Cis-montane region, ascending the mountains at least to 5,000 ft. alt.

*Continued from Page 143, Volume III, No. 8, November, 1904.



PLATE IX.

Eleocharis Parshii, Britton. Plant Life Size, Achene X 10.

Los Angeles; Davidson. Pasadena; McClatchie. San Jacinto Mts.; 2286 Hall, Parish. San Bernardino; Parish. Throughout North America, from Nova Scotia and Manitoba to Colorado and California.

S. atrovirens, Muhl. is reported in Abram's Flora of Los Angeles on collections by Davidson. But the specimens in Davidson's herbarium are not of this species, which is not to be expected in our region. It may be recognized by its larger and darker spikelets, 3-parted styles, and 3-angled achenes.

++ *Culms terete, sheathed at base; principal involucreal leaf stiff and pungent, apparently continuous with the culm; stamens 3.*

++ *Secondary involucreal leaf scale-like, inconspicuous, or wanting; bristles 6, retrorsely barbed.*

8. **Scirpus lacustris**, Linn. Sp. Pl. 48. **S. lacustris occidentalis**, Watson, Bot. Cal. 2:218. Tule.

Culm stout, rarely obtusely 3-angled above; sheaths leafless, or bearing a single short, broad leaf; involucreal leaf triangular above, 2-3 cm. long; bracts of the raylets scarious; umbel compound, the numerous spikelets many-flowered, oblong-conic, 5-10 mm. long, in ultimate sessile clusters of 2-10; scales pale brown, marked with fine, short, purple lines, at maturity rufous, smooth, or pubescent on the midvein, narrowly ovate, 4-5 mm. long, the midvein excurrent as a short upwardly barbed awn from the ciliolate, obtuse or emarginate apex; achenes lead-colored, obovoid, mucronulate, 2 mm. long, exceeding the bristles.

Very common in swamps of the Cismontane region, often covering large areas; it ascends the San Bernardino Mts. to 7,400 ft. alt., and also occurs infrequently in the marshes of the desert. Witch Creek and Sweetwater Valleys, San Diego Co.; Alderson. Orange: Mrs. M. F. Bradshaw. Newport, Long Beach, Oceanside, San Bernardino; Parish. Bluff Lake, San Bernardino Mts.; Miss Nora Pettibone. Throughout North America.

There appear to be no sufficient characters to separate the California plants from the species.

++ ++ *Secondary involucreal leaves mostly more than one, either pungent, or short and grass-like; bristles 4. short-plumose.*

9. **Scirpus Tatora**, Kunth. Enum. 2:166. Watson, Bot. Cal. 2:218. **S. Californicus**, Britton, Trans. N. Y. Acad. 11:79. Britt. & Br. Ill. Fl. 1:267.

Culms stout, 2-3 m. tall; umbel diffuse, decompound; primary rays flattened, up to 3 dm. long; involucels of the secondary rays grass-like or scarious, those of the ultimate raylets scarious; spikelets numerous, in sessile clusters of 2-4, or solitary, oblong-conic, 1 cm. long; scales brown or fuscous, smooth,



PLATE X

Scirpus Pacificus, Britton.

ovate-oblong, 3 mm. long, the mid-vein excurrent from the obtuse, ciliolate apex as a short rough awn; achenes lead-colored, shining, obovoid, mucronate, 2 mm. long, equalled by the bristles.

In brackish marshes of the coastal subregion; less abundant than the preceding species, and, like it, known as Tule. Los Angeles; Nevin. Oceanside, Compton; Parish. North to Sacramento, east to Florida, south to Mexico, Central and South America.

6. *HEMICARPHA*, Nees & Arn. *Edin. New Phil. Journ.* 17:263.

Low annual herbs, with filiform culms and narrow leaves. Spikelets 1-3, terminal, subtended by a 1-3 leaved involucre. Scales spirally imbricated, deciduous, all subtending perfect flowers. Perianth a minute hyaline scale at the base of the flower and next to the rachis. Stamens 1-3, style 2-cleft, deciduous; achenes turgid or lenticular.

A genus of but three species, natives of temperate and tropical regions; two of them North American.

1. *Hemicarpha occidentalis*, Gray, *Proc. Am. Acad.* 7:391.

Culms 5-25mm. tall, flattened; leaves conduplicate, exceeding the culms, those of the involucre similar, 1-2 of them surpassing the inflorescence; spikelets 1-2, squarrose, ovoid to globose, 2-4mm. high; scales 1-2mm. long, scarious, ovate, obliquely truncate, the thickened midvein prolonged into a stout, long tip; floral scales obovate, truncate or erose, 2-4 nerved, less than half as long as the achene, deciduous, or rudimentary; achenes 0.5mm. long, oblong-obovoid, mucronulate, minutely roughened.

Growing in small tufts, in wet sand, at Bluff Lake, 7,400 ft. alt., in the San Bernardino Mts., June 20, 1894, 3268 Parish. This is the southern known limit of the species, which extends in the Sierra Nevada northward to Washington. The type was collected by Bolander in the Yosemite.

7. *CLADIUM*, P. Br. *Hist. Jam.* 114.

Perennial herbs with stout rootstocks. Culms, stout, erect, 3-angled or terete, leafy with elongated channeled leaves. Spikelets small, few-flowered, variously clustered. Scales about 5, closely imbricated, the lower empty, the middle subtending imperfect flowers, the upper fertile. Stamens 2-3. Style 2-3 cleft, deciduous from the apex of the achene. Achene ovoid or globose, without a tubercle.

A genus of 25 or more species, of tropical or temperate countries; only the following widely distributed species occurring in our region.

✓ 1. **Cladium Mariscus**, P. Pr. Prodr. Fl. Nov. Holl. 1:236. Coville, Death Val. Rep. 213. **C. Mariscus Californicum**, Wats. Bot. Cal. 2:224.

Culms numerous, in dense tussocks, stout, 18-24 dm. tall; leaves 2cm. or more broad, strongly ribbed, sharply and rigidly serrate on edges and keel; panicles 6-8, diffuse and drooping, from the axils of short triangular-tipped leaves; spikelets in numerous clusters of 2-3, narrowly oblong, 4-6mm. long; scales light-brown, ovate to lanceolate, acutish or acuminate; stamens 2; achenes brown, ovoid, attenuate upward, about 2mm. long.

Collected some 40 years ago by Brewer "in a swamp near San Gabriel", but not since met with in the Cismontane region. Mistakes are known in Brewer's locality labels, and this may be one. In the Desert region it was collected by Coville & Funston at Furnace Creek and Resting Springs Valley, both in Inyo Co. Widely distributed in the warmer parts of the world; in the U. S. confined to the Pacific coast.

(To be continued.)

The Bees of Southern California.—VII.*

BY T. D. A. COCKERELL.

ANTHOPHORINAE.

The following table will facilitate the identification of an interesting series of Anthophorinae received from Dr. Davidson. A few species, represented by rather inadequate material, have not been identified.

Clypeus partly or wholly light.....	1
Clypeus all black.....	5
1. Clypeus with only a yellow patch on apical margin; males (Los Angeles).....	Xenoglossa angelica , Ckll.
Clypeus with only the anterior margin broadly yellow; small species.....	Anthophora curta petrophila , Ckll.
Clypeus yellow, with two large black patches above	2
Clypeus all light, white or cream-color.....	3
2. Legs ordinary (Los Angeles).....	Anthophora maculifrons , Cresson, male
Legs very peculiar (Strawberry Valley).....	Anthophora flexipes , Cresson, male
3. Antennae long; males (Catalina I., Bear Valley, Los Angeles, Rock Creek).....	Melissodes agilis , Cress.
Antennae shorter	4

*Continued from Page 166, Vol. III, December, 1904.

4. Larger, abdomen not banded; males (Los Angeles)
.....**Emphoropsis floridanus** (Smith)
Smaller, abdomen not banded; males (Bear Valley,
Los Angeles, Tehachapi) **Anthophora urbana**, Cress.
5. Marginal cell much shorter than the first discoidal;
females.....**Anthophora urbana**, Cress.
Marginal cell not so..... 6
6. Size small; end of marginal cell far from costa; fe-
males (Los Angeles).....
.....**Anthophorula coquilletti** (Ashm.)
Size larger 7
7. Hair of face black; males (Los Angeles, Banning)..
.....**Diadasia nereia**, Fowler
Hair of face not black..... 8
8. Males; apex of abdomen bituberculate..... 9
Females 10
9. Large, abdomen banded (Los Angeles, Rock
Creek).....**Diadasia cinerea**, Fowler
Smaller, abdomen not, or not distinctly, banded
(Banning)**Diadasia** sp.
10. Scopa on hind tibiae and tarsi black (Los Angeles).
.....**Diadasia** (? female of **cinerea**)
Scopa on hind tibiae and tarsi light.....11
11. Abdomen with broad white bands on segments 2
to 4 (Los Angeles, Lancaster).....
.....**Synhalonia fowleri**, Ckll.
Abdomen without such bands.....12
12. Facial quadrangle broader than long; size larger.13
Facial quadrangle about square; size smaller...14
13. First recurrent nervure joining end of second sub-
marginal cell (Rock Creek).....**Melissodes** sp.
First recurrent nervure joining second submarginal
cell much before end (Los Angeles).....
.....**Xenoglossa davidsoni**, Ckll.
14. Larger; tegulae ferruginous; no black hair on thor-
acic dorsum (Los Angeles, Palm Spring)....
.....**Diadasia rinconis**, Ckll.
Smaller; tegulae darker.....15
15. Thoracic dorsum with black hair (often rubbed off);
size larger (Redondo, Catalina I.)...**Melissodes** sp.
Thoracic dorsum without black hair; size smaller
(Palm Spring).....**Diadasia diminuta** (Cress.)

Anthophora curta, Provancher, subsp. nov. **petrophila**.

Female; length about $7\frac{1}{2}$ mm.; flagellum, except first joint, dark rufous above and bright ferruginous beneath (the flagellum is colored as in male **A. flexipes**), last joint subtruncate; eyes pale greenish-ochreous, probably green in life; face-marks pale lemon-yellow, the supraclypeal mark reduced to an inconspicuous streak; hair at apical middle of fifth abdominal segment dark fuscous.

Rock Creek, Cal., one collected by Dr. Davidson. Easily distinguished by the color of the antennae, but probably only a geographical race. This belongs with the common species of New Mexico, which I have always called **A. maculifrons**, Cresson, it having been so determined for me by Mr. Fox. I find, however, that it is quite distinct from the true **maculifrons**, especially in the structure of the apex of the male abdomen, and it agrees very well with **A. curta**, Provancher. The insect of New Mexico is not **petrophila**, but so far as comparison with the description shows, true **curta**.

The real **A. maculifrons** was taken by Dr. Davidson at Los Angeles. Mr. Viereck has kindly examined Cresson's type, and reports that in the male the distance between the apical processes of abdomen at base is decidedly less than the length of the processes, which are rather parallel-sided.

Anthophorula coquilletti (Ashmead)

The specimens examined are females, but I feel confident that they belong to this species, of which only the male has been described. In the male the clypeus is yellow; **Anthophorula** is a group separated from **Exomalopsis** principally by this fact, and it is a matter of opinion whether it deserves full generic rank.

Similarly, **Dasiapis** is closely allied to **Diadasia**, but has a light clypeus in the male. Two species are known, separable thus:

Male about 10mm. long, with clypeus white (New Mexico) **D. ochracea**, Ckll.
Male smaller, with clypeus yellow (Mexico, California)
..... **D. olivacea** (**Melissodes olivacea**, Cress.)

Diadasia diminuta, Cresson.

The single female from Palm Spring is not precisely typical, and it is possible that a good series would indicate a geographical race.

Diadasia rinconis, Ckll.

A larger form (**D. rinconis opuntiae**, Ckll, 1901) is common on the bluffs at San Pedro, visiting the flowers of **Opuntia** (**lindheimeri** var?) **littoralis** (Engelm.)

(To be continued.)

Prehistoric California.*

BY DR. LORENZO GORDIN YATES.

Shells of *Saxidomus aratus*, and *Saxidomus nuttallii* were broken into pieces of suitable size, the edges rounded by rubbing on sandstone or other rocks and the holes drilled from both sides with stone drills. In Southern California the shell of *Callista callosa* was the material from which some of the milk-white beads were made.

Shells of *Lucapina crenulata* were used by the Santa Barbara Indians as money and ornaments. Sometimes the entire shell was used, at others the ends were cut off, the corners rounded as in Fig. 23, showing the crenated edges of the shell at the sides; or, the shell was cut down to a small oval ring, formed by the natural opening in the shell, as in Fig. 21. Sometimes a pointed projection was left at one end, but this form is rare.

The shell of the Californian Mussel (*Mytilus californianus*) was sometimes used for the manufacture of money like Fig. 22, and also for making small dark-colored beads similar to Figs. 29 and 30.

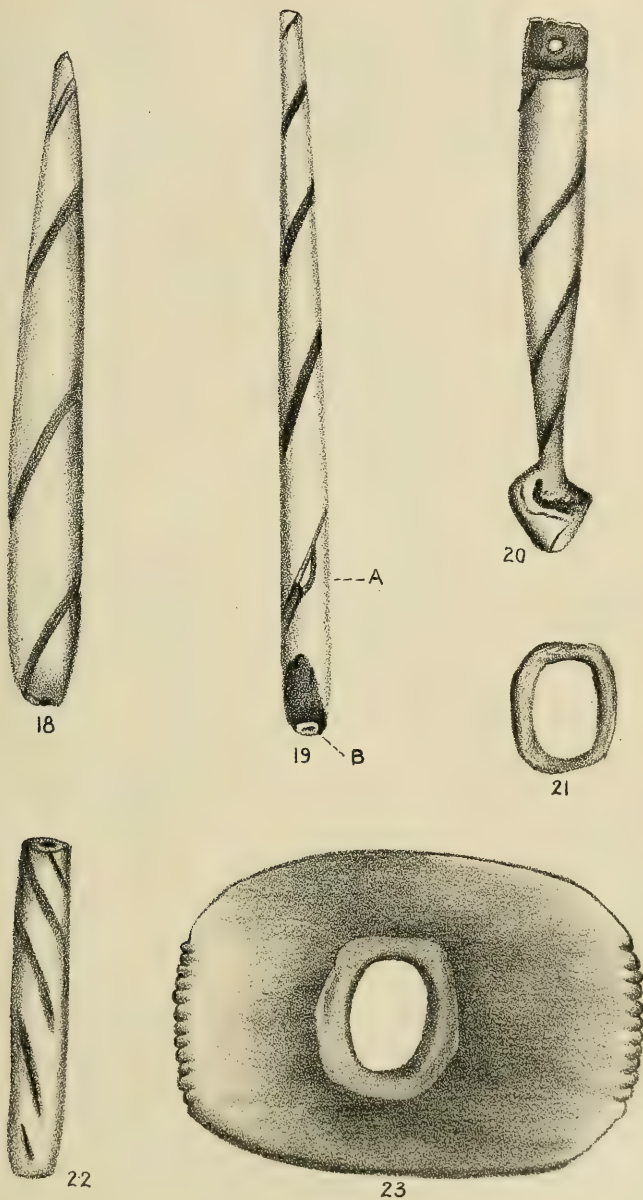
These shells grow to an immense size on the Channel Islands, off Santa Barbara, and I have found them ten inches in length, but that was many years ago, before the Chinamen had made such raids upon them.

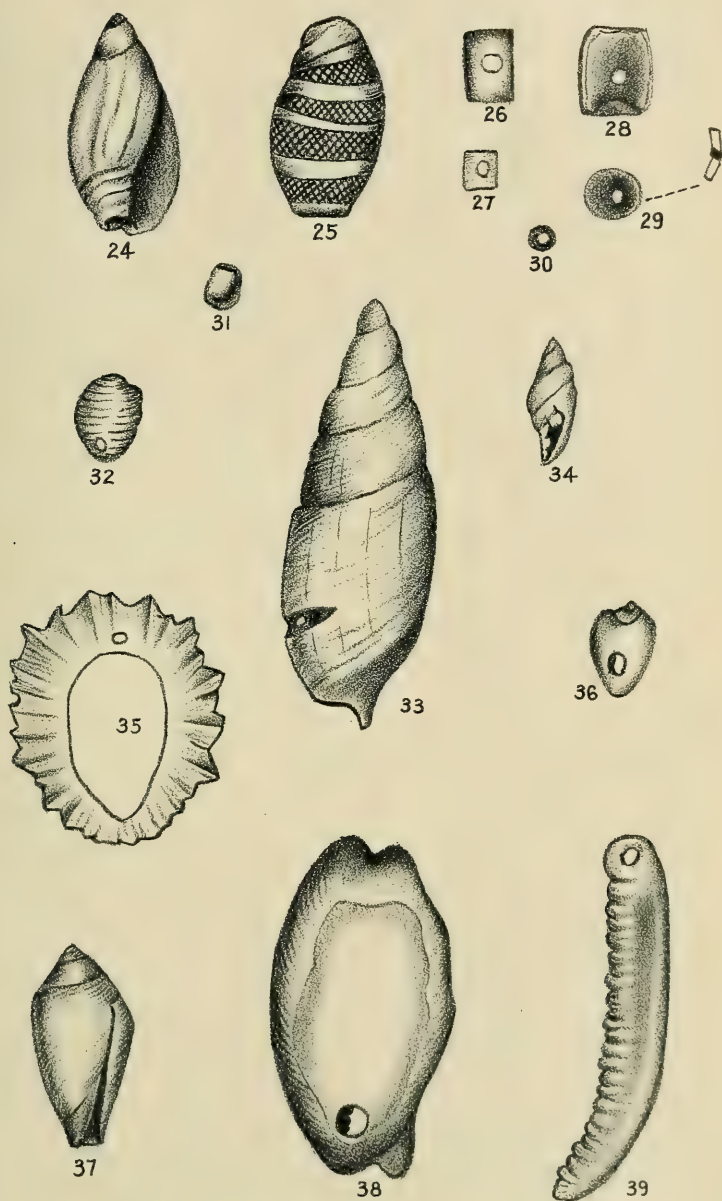
The columella of *Siphonalia* (*Kellettia*) *kellettii*, a fine large univalve shell found in the Santa Barbara Channel, was used for making the fine beads, or money, represented by Figs. 18 and 19. The natural spiral depression marking the line of growth of the shell, was worked out to a greater depth by the Indians, and the depressions thus intensified were filled with asphaltum.

These peculiar spiral lines, with the contrast of color between the ivory white of the shell and the black of the asphaltum made a very handsome bead or ornament. At the upper point of these beads a small hole was drilled to connect with the natural umbilical canal, and at the lower end, the natural opening, being too large for their purpose, was bushed by the insertion of a dentalium shell imbedded in the asphaltum with which the larger portion of the aperture was filled. This is well illustrated in Fig. 19, at A, where a portion of the asphaltum has been broken away, showing the natural opening in the center of the columella.

The shells of *Pomaulax undosus*, another handsome univalve, were used in the same manner, except that, as the last named

*Continued from Page 153, Vol. III, December, 1904.





L. G. YATES, DEL.

LITH. BRITTON & REY S.F.

ABORIGINAL SHELL MONEY OF CALIFORNIA.

shell has no umbilical opening, the columella was drilled transversely at the end, and formed pendants. Fig. 20 represents a bead made from this shell, on the lower end of which, a portion of the apex of the shell was left, to add to its beauty.

The "Olive Shell" (*Oliva biplicata*) seems to have been used all along the Coast for money. Fig. 24 represents a perfect specimen of large size, in its natural state; Fig. 25, a shell of this species highly ornamented with bands of incised lines, and Figs. 25 to 30, the various forms of money made from these shells.

In examining graves in Shasta County several years ago, thousands of beads made from the *Olivella* and from the bivalve shell, *Saxidomus nuttallii*, were found.

Fig. 31 represents either a young shell of *Olivella biplicata*, or a distinct species not found living on the coast except on some of the southern islands; it answers to the description of *Olivella pedroana*. The facts that shells of this character, of uniform size, have been found in ancient graves, in large numbers, and that the shells have the appearance of mature growth, and are all of exactly the same size, indicate one of two things, either that they belong to a different species from the large shells, or that the aborigines took a great deal of pains to select shells of this exact size.

Some twenty-five years ago, while examining a mound in San Mateo County, my attention was attracted by a pair of very large *Schizothærus nuttallii*, and on opening the valves I found them filled with shells of this size. Fig. 32 represents a shell of *Cypræa* (*Trivia*) *californiana* which was sometimes used by drilling a hole in one end for suspension, as represented in the figure. Fig. 28 is the large, handsome *Cypræa* (*Luponia*) *spadicea*, or cowrie, found in the Santa Barbara Channel and southward, used for the same purpose; sometimes by drilling a hole at one end, or, by grinding off the rounded top, leaving a large slit or opening formed by the mouth of the shell; or sometimes, as represented in Fig. 39, where one of the lips was utilized by grinding off the remainder of the shell.

Figs. 33 and 34 show the Mitre Shell, (*Mitra maura*), the larger one having a notch ground through it, probably by means of a sandstone file, thus forming the hole for stringing or suspending it.

Fig. 36, (*Erato vitellina*), is a somewhat rare shell, occasionally used. Fig. 35, one of the "Limpets" (*Acmaea spectrum*), had its apex removed by grinding, and a small hole drilled near the edge for stringing. Fig. 37, the "Californian Cone", (*Conus californicus*), was sometimes used by grinding off the apex, as in the *Olivellas*.

(To be continued.)

Flora of Clifton, Arizona. II.*

BY A. DAVIDSON, C. M., M. D.

CRUCIFERÆ.

Draba cuneifolia Nutt. Clifton. May.

Thysanocarpus filipes Greene. Canyon near Coronado Mine.
This plant grows but sparingly in this place, and no trace of it has been observed in adjacent places at a like altitude.

Lesquerella purpurea Wats. In shady canyons, flowering all summer.

Lesquerella gordonii Wats. Abundant on the plains in spring.

Dithyrea wislizeni Engelm. Sands of the Rivers Frisco and Gila. April.

Thalapse alpestre L. Shaded rocks, Chase Creek. April.

Lepidium lasiocarpum Nutt. Railway bank near Guthrie, probably introduced.

Lepidium montanum Nutt. From Duncan to Lordsburg and eastward, common. September.

Lepidium medium Greene. Clifton. April.

Sisymbrium canescens Nutt. Common. April.

Sisymbrium incisum Engelm. Common. May.

Nasturtium terrestre hispidum F. and M. Guthrie. April.

Dryopetalon runcinatum Gray. Shady ravines. May.

Arabis holboellii fendleri Wats. Rocky canyons. March.

Thelypodium wrightii Gray. Frequent in the higher ravines. July.

Thelypodium linearifolia Wats. Above Metcalf. September.

Thelypodium micranthum Wats. Metcalf and Blue River. September.

Streptanthus carinatus Wright. Occasional in the canyons. April.

VIOLACEÆ.

Ionidium polygalæ folium Vent. Blue River. September.

CAROPHYLLEÆ.

Cerastium texanum Britton. Metcalf. May.

Arenaria saxosa Gray. Coronado canyon. Flowers all summer.

Silene antirrhinum L. Frequent. April.

*List of Plants. Continued from Vol. III, No. 7, Oct., 1904, p. 111.

Silene greggi Gray. Local near Metcalf. September. In the last edition of the Synoptical Flora this has been reduced to a variety of **laciniata**, but the broader leaves and totally different habit of growth justifies its being retained as a species as Gray described it. It grows in dense clumps a foot or so in breadth and about two feet in height, with upright stems very different from the isolated, decumbent, straggling **laciniata** as seen in Southern California.

PORTULACACEÆ.

Portulaca lanceolata Engelm. Common. September.

Portulaca stelliformis M&S. Blue River. September.

Portulaca pilosa Metcalf and Blue River. September.

Portulaca parvula Gray. Blue River. September.

Talinum lineare HBK. Rocky slopes. September.

Talinum patens Willd. Shady canyons. Metcalf and Upper Frisco.

Calyptridium monandrum Nutt. Clifton.

FICOIDEA.

Trianthema portulacastrum L. Common. September.

Mollugo cerviana Seringe. Metcalf. September.

TAMARISCINEÆ.

Fouquieria splendens Engelm. Common and used as a garden fence by the Mexicans. It readily roots when so planted.

MALVACEÆ.

Sphæralcea fendleri Gray. Common; flowering all summer and very variable as to fruit and foliage.

Anoda triangularis DC. Frequent above 4,000 ft. alt. Sept.

Anoda pentaschista Gray. With the last.

Sida lepidota Gray. Local near Duncan. September.

Sida diffusa HBK. Common on rocky ground.

Abutilon sonore Gray. Two large specimens of this handsome plant were found near Johnson's Ranch on Blue River. This is the first record of this Mexican species having been found in the United States.

Abutilon incanum Sweet. Frequent.

Hibiscus denudatus Benth. Not uncommon. The involucels are usually eight and sometimes nine in number.

Malvastrum exile Gray. On the river bank above Clifton and probably not uncommon though not hitherto credited to Arizona.

STERCULIACEÆ.

Ayenia pusilla L. Frequent.

LINACEÆ.

Linum lewisii Pursh. Common, especially on the Lordsburg Plains.

Linum aristatum Engelm. Local on Frisco River. August.

NOTES AND NEWS.

Professor Harris J. Ryan, of Cornell University, is appointed Professor of Electrical Engineering at Stanford University.

Columbia University, New York City, has received a gift of \$50,000 from Mr. Edward D. Adams, to found a research fellowship in physical science, in memory of Ernest K. Adams, son of the donor.

Those who wish to obtain sane and authentic information upon the subject of "Radio-Activity" should read the recent work of Professor E. Rutherford, which discusses the matter in a "calm and judicial manner" freed from speculation and unwarranted hypotheses.

Southern California is becoming noted for its yield of gems. Turquoise and opal of marked excellence have been obtained from the Mohave desert. Rare tourmaline, spodumene and other crystals are being mined near Pala, in San Diego county, and the field is wide open for further discovery.

It is reported that Mr. Andrew Carnegie has given \$540,000 to supplement a fund of \$270,000, which has grown from an original donation by Benjamin Franklin, of \$5,000, bestowed a century ago. The total amount will be devoted to the forming in Boston of an establishment like the Cooper Institute of New York City.

The National Geographic Magazine, the organ of the National Geographic Society, in its December issue, has several timely and valuable articles, fully illustrated. Relief maps of Alaska, Porto Rico and the Philippine Islands, illustrate the government telegraphic system. Hon. Jno. W. Foster contributes a most acceptable paper on China. Dr. J. D. Hague gives the results of careful study made in a cruise of the U. S. ship Tacoma, sent to investigate doubtful islands in the Pacific along the sailing course between Panama and Hawaii. The results are extremely interesting, but cannot be detailed here. A review of W. K. Fisher's "Birds of Laysan Island, H. I.," with illustrations of vast droves of the albatross, makes good reading, and other abstracts of value appear in this number. The January issue, forthcoming, will contain a chart of the world, showing all submarine cable systems and connections and also the steamship routes of the world.

There are sent out with this issue Plates 1 and 2, illustrating **Pre-historic California**, by Dr. L. G. Yates. These belong with the issue for December, 1904, (Vol. III), and should be inserted:

Plate 1, between Pages 154 and 155.

Plate 2, between Pages 156 and 157.

The Index to Volume III, 1904, is in press and will be mailed with the February number of The Bulletin.

BULLETIN

OF THE

Southern California Academy of Sciences

COMMITTEE ON PUBLICATION

THEO. B. COMSTOCK, S. D.; A. DAVIDSON, C. M., M. D.; WM. H. KNIGHT.

CONTENTS:

	Page		Page
Academy Publications.....	21	Prehistoric California by Dr Lorenzo	
Transactions for January, 1904.....	22	Gorden Yates.....	26
Academy, Directors.....	22	The Bees of Southern California—VIII	
Sections, Biology, Astronomy.....	22	by T. D. A. Cockerell.....	28
Botany, Geology.....	23	A Dermoid Cyst, by Dr. C. A. Whiting.....	33
Publications Received.....	24	Shall We Permit This? (Editorial).....	34
Publications Reviewed.....	24	Flora of Clifton, Arizona—III, by	
Notes and News.....	25	A. Davidson, C. M., M. D.....	35

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ACADEMY PUBLICATIONS.

As requested by many members, we here give the list of the **Proceedings** so far published by the Southern California Academy of Sciences. Owing to the demand, all are now out of print except No. 2.

- Vol. 1. No. 1. "Catalogue of the Plants of Los Angeles Co." by Anstruther Davidson, C. M. M. D. July, 1896.
- Vol. 1. No. 2. "Eucalyptus", by Abbot Kinney. Sept., 1896.
- Vol. 1. No. 3. "California Bees and Their Parasites", (short paper), by A. Davidson, C. M. M. D. April, 1897.
- Vol. 1. No. 4. "Lichens of Southern California", by Dr. Hasse. 1897.
- Vol. 1. No. 5. "Seedless Plants of Southern California", by A. J. McClatchie, A. M. July, 1897.
- Vol. 1. No. 6. "Antiseptic Vegetation for Cuba", by A. Campbell Johnston. Sept., 1899.

TRANSACTIONS FOR JANUARY, 1905**I. ACADEMY SESSION, JANUARY 2.**

(Owing to the Holiday season, the lecture set for this evening was postponed to the first Monday in February, by vote of the members present.)

II. MEETING OF DIRECTORS.

(The minutes of the Board meeting in January were published in the preceding number of the Bulletin.)

III. MEETINGS OF SECTIONS.**1. Section of Biology.**

Meeting held January 9, 1905.

Owing to the unavoidable absence of the Chairman of the Section, Professor Dozier called the meeting to order and presided during its session. The minutes of the last meeting were read and approved. The lecture of the evening, delivered by Dr. Leonard, City Bacteriologist, was of such unusual interest that we shall try to present a comprehensive outline of it in The Bulletin. An extremely interesting feature of the evening was the opportunity to examine pathological preparations furnished by Dr. Leonard. This was done by means of microscopes loaned by the Pacific College of Osteopathy.

The February meeting of the Section will be addressed by Dr. Edith Claypole, her subject being "The Present Aspect of Cellular Chemistry."

About thirty-five members and visitors attended this meeting.

C. A. WHITING, Secretary.

2. Section of Astronomy.

The January meeting was held at the State Normal School on the 16th, Chairman W. H. Knight presiding.

The chief topic of discussion was Jupiter and its satellites, with kindred subjects suggested by this. Mr. Knight read an article descriptive of the recent discovery at the Lick Observatory of the sixth moon of Jupiter, by Prof. Perrine of that institution. The result was secured through photography by means of a new and superior photographic apparatus furnished by the liberality of Mrs. Phoebe Hearst.

All the facts relative to the distance, size and motion of this newly discovered body cannot be determined until further observations have been made; but it is suspected that the revolutionary motion is contrary to that of the other satellites of Jupiter.

By blackboard illustration Mr. Knight explained a somewhat commonly accepted theory, accounting for the counter revolution of a satellite as a consequence of its counter rotation.

Mr. Knight, however, questioned the correctness of this theory, and advanced in its stead the more plausible one that the supposed satellite is a comet captured by the attractive force of the giant planet, whose motion when drawn into the grasp of this great central body was contrary to that of its satellites.

Mr. Knight then proceeded to give a historic account of the discovery of the four moons of Jupiter by Galileo and of the development of the knowledge of the planetary system, showing with what reluctance the people accepted announced changes in what was long regarded as settled

knowledge, because of the disturbance of imaginary relations between accepted numbers and certain numbers made of sacred significance by treasured tradition.

The Chairman stated that Jupiter's surface is surrounded to the depth of several thousand miles by a luminous vapor of considerable density, which is supposed to shut out the light and heat of the sun from the body of the planet.

The intense luminosity of Jupiter is due to the reflecting power of this enveloping vapor, and is greatest towards the center of the disk.

This is opposite to the fact touching the brilliancy of the face of the moon, which is greatest toward the edge of the disk.

The discussion drifted into a consideration of the causes and movements of earthly tides.

Mr. Dozier gave a blackboard illustration of the prime causes of tides and their variation, showing them to be due to the attractive forces of the sun and the moon and the centrifugal forces generated by the revolutions of earth and sun and moon about common centers of revolution.

Much interest was manifested in all phases of the discussion by the appreciative members present.

MELVILLE DOZIER, Secretary.

3. Section of Botany.

(No meeting was held in January.)

4. Section of Geology.

January meeting.

The Geological Section of the Academy met at the State Normal School Building, Monday, January 23, at 8 p. m. Chairman George W. Parsons called the meeting to order and introduced Prof. W. C. Mendenhall, of the U. S. Geological Survey, as the speaker of the evening.

He took for his subject "The United States Geological Survey and Its Work." He stated that many years ago the Government was the pioneer in the survey of the topographical and geological status of the western States and Territories. He gave a vivid description of Major Powell's exploration of the Grand Canyon of the Colorado. He also stated that the different Government surveys were united under one head March 3, 1879, by Act of Congress, and that numerous correct topographical and geological maps, which would be of great assistance to the geologist and miner, had been made at great expense.

As to the value of those maps, he referred to the constant use made of them in the districts of Cripple Creek, the Comstock lode, the Butte region, the iron fields of Michigan, and in the Tonopah district.

He also reviewed the studies made in the measurements of water courses, and announced that the contract for the Yuma Dam would probably be let sometime next month, a project which will irrigate 107,000 acres.

The speaker gave reminiscences of his own explorations in Alaska in 1895 and 1896, including his experience on the Yukon river in an open canoe. He described the manner of obtaining the altitude of Mt. McKinley, which is somewhere between 20,300 feet and 20,500 feet.

The lecture was well attended and full of interest.

Questions were asked and answered.

G. MAJOR TABER, Secretary.

PUBLICATIONS RECEIVED.

U. S. Department of Agriculture:

Bureau of Plant Industry. Bull. No. 51, Part VI. 2Pl. "Golden Seal." By Alice Henkel and G. Fred Klugh. Bull. No. 69. "American Varieties of Lettuce." By W. W. Tracy, Jr. XXVII Pl.

Bureau of Chemistry. Bull. No. 83, Part I. "Foods and Food Control." Part II. "Legislation During Year Ending July 1, 1904." By W. D. Bigelow.

University of California, Agricultural Experiment Station:

Twenty-second Annual Report. Bull. No. 162. "Commercial Fertilizers." By George Roberts.

Smithsonian Institution, U. S. National Museum:

Directions for Collecting Information and Specimens for Physical Anthropology." By Ales Hrdlicka.

Transactions and Proceedings of the Botanical Society of Penna.. 12 Pl. (Contributed by Dr. O. P. Phillips.) Various writers.

PUBLICATIONS REVIEWED.

The Genus *Ribes* in California. A. A. Heller. *Muhlenbergia*, Vol. I, No. 5. Sept., 1904.

In this paper the author supplies a great convenience for the study of the genus of which it treats, by bringing together the scattered original descriptions of the forty-one species which he recognizes as occurring within the State limits. He is to be commended further for providing a key, in the construction of which much careful work has evidently been expended. The usefulness of papers similar to this is often greatly impaired by the absence of any provision whereby a specimen may be traced to its appropriate species. A key is, also, to some extent, a test of the validity of species, inasmuch as it brings into relief the saliency, or the obscurity, of the characters by which they are distinguished. Judged by this test, one is disposed to suspect that a careful revision of the genus will rather diminish than increase the number of the species here recognized.

In the same number of *Muhlenbergia*, two new species are proposed founded on Southern California plants. These are *Eriodictyon trichocalyx*, from Seven Oaks, and *Orthocarpus exsertus*, from the neighborhood of Pasadena. The types of both species were collected by Mr. G. B. Grant. S. B. P.

The increasing demand for the drug "Golden Seal" has prompted the issue of a pamphlet on the subject by the U. S. Dept. of Agriculture. In it directions are given for the growth and propagation of the plant, with an appended list of prices that suggest one more lucrative industry for the agriculturist. D.

Foods and Food Control, a recent Bulletin of the Bureau of Chemistry, U. S. Dept. Agric., is a compilation of the legislation enacted in the several States during 1904. D.

Commercial Fertilizers. Bull. No. 162 of the Ag'l Exper. Sta. of the Univ. of California.

The analyses and valuations of the various fertilizers used in California are here given, so that it becomes a valuable guide to the farmer using such products. D.

Of 404 so-called varieties of lettuce illustrated in seedsmen's catalogues, Mr. W. W. Tracy finds that 107 are really distinct. Of these more than 70 are illustrated by photographic plates in the bulletin describing them. This bulletin is an example of most thorough work.

The Transactions and Proceedings of the Botanical Society of Pennsylvania, Vol. I, No. 3, 1904, contains several papers of more than ordinary value to students of biology. Dr. O. P. Phillips, in a "Comparative Study of the Cytology and Movements of the Cyanophyceæ" reaches conclusions bearing upon questions in heredity and cellular development. He also shows that this group of organisms is not properly separated from the true algæ. The work of Cassius H. Watson proceeds along cognate lines, with a graded series of plant forms, with a view to defining the "Structure and Relation of the Plastid." This he comes to regard as primarily representing "nuclear differentiations of the cell." Both these papers are clearly illustrated by numerous figures, and the volume contains other well illustrated papers on the structure and development of special forms of the higher plants, by Dr. Henry S. Concord, Harriet Boenig, Dr. J. M. McFarlane and others. These are all worthy of careful review, which is precluded here by lack of space.

NOTES AND NEWS.

Professor T. A. Jaggar, of Harvard University, will conduct a geological expedition to Iceland in the summer months of this year. The party will go from Boston late in May, via Liverpool and Leith, giving about six weeks to the study of the coast and interior of Iceland.

Harvard University, New York University and the Bermuda Natural History Society together extend an invitation to botanists and zoologists to work in the temporary biological station at the Flats, Bermuda. The members will start from New York about July 1, returning in six weeks. Applications, not later than May 1, will be received by Professor E. L. Mark, 109 Irving Street, Cambridge, Mass., or by Professor C. L. Bristol, New York University, New York City.

The death of Professor Alpheus S. Packard, February 15, 1905, has removed from the faculty of Brown University a factor of moment, and throughout America and Europe ties have been severed which were of more than usual strength. Among those who have done most for science and who held up its ideals in the period of struggle, the name of Alpheus Packard shines bright, and very many of those now most honored received their first impetus from his words and acts. No better example of the surpassing influence of modest worth could be set before youth as a model.

There may be some hope yet for American Institutions now that the gelatinous mass of legal traditions is receiving real earnest scientific study at the hands of men as capable as Hon. Simeon E. Baldwin, who discussed in this manner the "right of escheat", in his address as Vice President (Chairman of Section I) of the American Association for the Advancement of Science, at Philadelphia, last January. And while we are upon this subject, with the heartrending tragedy near Hollywood fresh in mind, why do we not insist upon better laws and better execution of the law with reference to the well known dangers of grade crossings of highways and railways? In this stage of scientific advancement which denies the divine right of kings, must we accept divine rights of corporations instead thereof?

Prehistoric California.*

BY DR. LORENZO GORDEN YATES.

The "Abalone" (*Haliotis*), was more generally used by the aborigines of Southern California, doubtless on account of the exquisite beauty of its iridescent colors and the abundance of the shell. Upon this they exercised their ingenuity and artistic taste, by working up the fragments into beads and ornaments of almost endless variety, of forms; in circles, triangles, right-angle triangles, squares, rhombs, ovals, spheres, crosses, keystones and all sorts of combinations, some of them with one drill-hole, and some with several; and, also, making use of the natural openings of the shell.

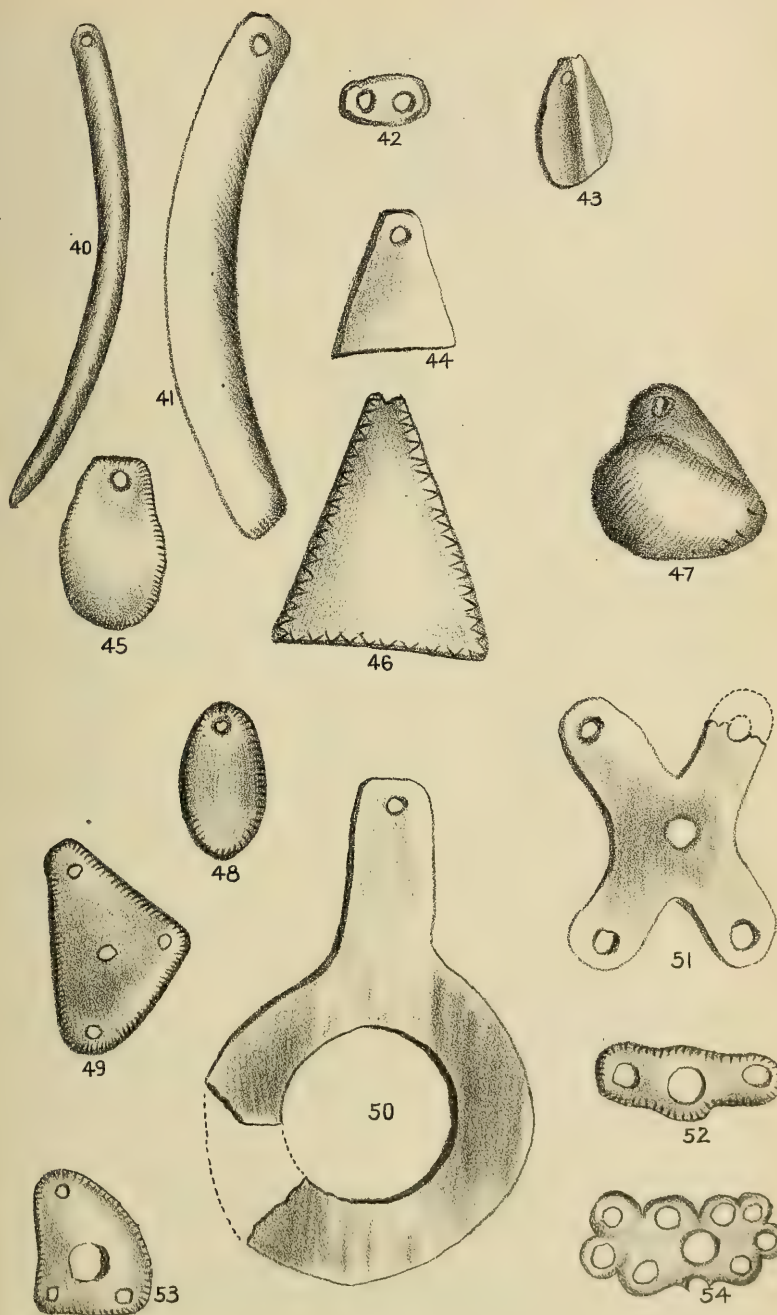
In addition to the natural beauty of these ornaments the edges were often finely notched, or adorned with incised lines of the "herring-bone" and other patterns, as shown in Figs. 45 to 54, etc., (Plate 5.) They also used the pearls found in the *Haliotis* and other shells, by drilling through their long diameter; and, in absence of the natural pearls, they formed artificial ones from the thick portions or from abnormal growths. These they drilled in the same manner as in Figs. 15, 16, 17, (Plate 2.) etc., and ornamented them also. Fig. 47 illustrates what appears to be an abnormal growth, almost like a natural pearl, with a hole drilled in the smaller end.

In addition to the numerous species of shells used for money and ornaments, various minerals were evidently highly esteemed for those purposes. Transparent crystals of quartz from one to three inches in length and from one-half to three-quarters of an inch in diameter have been found in ancient graves. One end of these crystals shows the natural termination; at the other end a mass of asphaltum has been attached, forming a rounded terminus, in which a loop of string has been imbedded to facilitate suspension.

Large numbers of cylindrical, spherical, ovoid, disk-shaped, hexagonal, and double-conical beads have been found, generally drilled through their long axis; they are mostly made of serpentine, steatite, or slate.

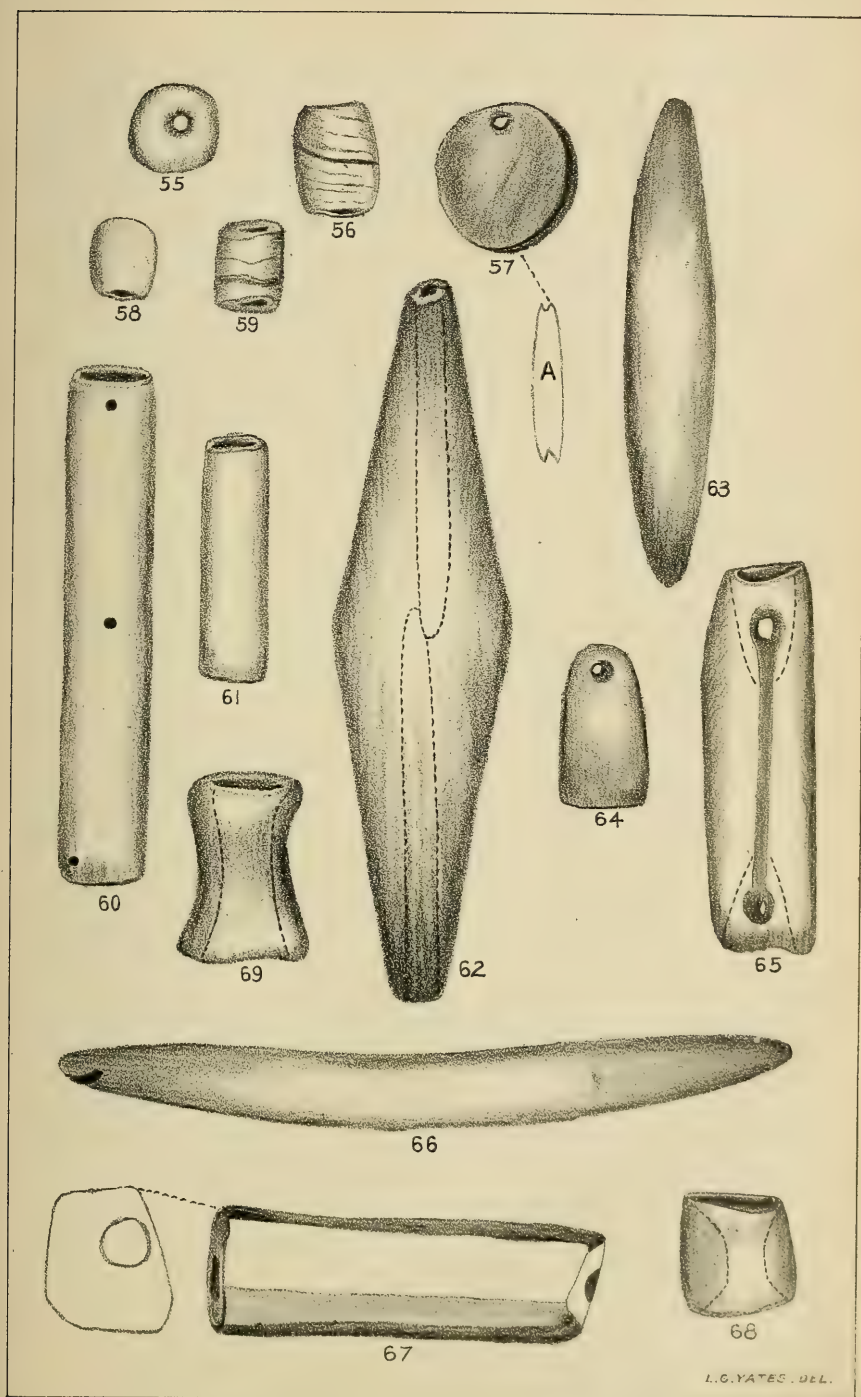
The Indians of Lake and Napa counties make beads from a peculiar rock, the locality of which they keep secret. This rock resembles in some respects the celebrated catlinite, or "Pipe-stone," of Minnesota, which was valued by the Indians, bulk for bulk, in silver. This Californian mineral is said to be easily worked when first quarried and made into beads, one of which is represented by Fig. 78 (Plate 7.) The beads

*Continued from Page 16, Vol. IV, No. 1, January, 1905.



L. G. YATES, DEL.

LITH. BRITTON & REYS, F.



were afterward subjected to the action of fire, which changed the color and rendered them very hard and durable. They were valued at from five to twenty-five dollars each.

During the writer's travels through the region where these beads were made and used, special effort was made at various times to discover the locality of this rock, but the Indians steadfastly refused the desired information, or feigned ignorance as an excuse. One bead and a fragment found in a grave were all that could be obtained, except a few specimens of the material in the rough, which occurred as "float rock".

Notable exceptions to the general use of soft rocks for the manufacture of stone beads for money and ornaments, are the occasional discoveries of specimens similar to those represented by Figs. 55, 56, 58, and 59 (Plate 6.) The original of Fig. 55 looks like purple fluor spar, but is much harder; Fig. 56, of agate, with a blue tinge, approaches an amethystine color; Figs. 58 and 59 are of the same character of rock, intermediate in color between Figs. 55 and 56. These appear to have been drilled from both ends by a tapering drill. Such beads must have been highly valued in consequence of the amount of labor involved in the working of such hard stone. Fig. 57 shows a perforated disk of serpentine with a deep groove worked around the entire circumference; such a groove would be available to hold a string for the suspension of other objects.

Fig. 60 is another fine specimen made of a hard, steatite rock, perfectly cylindrical in shape, the hole being uniform in size through its entire length, and has three small holes drilled through from side to side, across the large opening.

It is probable that implements of sandstone similar in form to Fig. 66, which have been found in graves, were used for smoothing the large holes made by drills.

Fig. 67 is probably one of the same character as Figs. 60 and 61, unfinished, showing that the hole was made through the bead previous to the working of the surface into shape. Fig. 65 seems to have been intended for a longitudinally drilled bead, but the artificer probably changed his mind and drilled it transversely, making a peculiar groove from one hole to the other on one side.

(To be continued.)

The Bees of Southern California. VIII.*

BY T. D. A. COCKERELL,

Synhalonia fowleri; n. sp. (*belfragei*, subsp?)

Female, length 11 to 12 mm., allied to *S. belfragei* (Cresson), but differing thus; rather smaller, head broader in proportion to its length, pygidial plate narrower, clypeus with a more or less distinct raised line down the middle. This may be nothing but a geographical race of *S. belfragei* (which is known from Texas and Illinois), but it has rather a distinct aspect. I suppose that the insect collected by Knuth at Berkeley, Cal., and recorded by Alfken as *belfragei*, was *fowleri*. *S. californica*, Fowler (not of Cresson) is evidently *S. fowleri*; it is too small to be *S. edwardsii*.

Six from Los Angeles, one from Lancaster, Cal., collected by Dr. Davidson.

Xenoglossa davidsoni, n. sp.

Female, like that of *X. angelica*, Ckll., but differing thus; tegulae very dark brown (ferruginous in *angelica*), small joints of tarsi black, abdomen black (apical half of segments 2 to 4 red in *angelica*), the apical halves of segments 3 and 4 with a silvery pruinosity (well-marked only on 4), the bases of those segments with very fine yellowish tomentum, the fifth and apical segments with shining golden-reddish hair, the second segment with no conspicuous hair, the ventral bands of suberect hair (all orange in *angelica*) very pale yellowish except the subapical one, which is orange, the pygidial plate less pointed, much broader at end.

One from Los Angeles, (Dr. Davidson). First recognized as new by Mr. Cresson, but he writes me that he does not care to describe it. It may possibly be an extreme variety of *X. angelica*, but it seems sufficiently distinct. The females of *X. davidsoni* and *angelica* both have the mandibles entire at apex, not bidentate as Robertson describes for *Peponapis pruinosa*.

Melissodes agilis. Cresson.

The males sent by Dr. Davidson show a good deal of variation, and may represent two or three distinct races, possibly species. At present, however, I do not feel able to separate them specifically from the *agilis* of the Rocky Mountain region. The following table indicates the variations:

*Continued from Page 13, Vol. IV, No. 1, January, 1905.

- Third antennal joint longer than broad; mandibles with a large yellow spot; basal nervure falling a considerable distance short of transverso-medial.....
Var. 1. (Bear Valley.)
- Third antennal joint broader than long.....1.
1. Mandibles with a large yellow spot; basal nervure falling only a little short of transverso-medial.....
Var. 2. (Catalina I.)
- Mandibles with a minute yellow spot.....2.
2. Flagellum red above.....Var. 3. (Los Angeles.)
 Flagellum black (or almost) above..Var. 4. (Rock Creek.)

***Synhalonia hirsutior*, n. sp.**

Male, length 12 mm.; black, with abundant pubescence all over the head and body, on the mesothorax so dense as to conceal the surface, but leaving the surface of the abdomen easily visible. Facial quadrangle broader than long; face, labrum and mandibles entirely black, but the clypeus appearing pale from the dense covering of long sordid white hair; hair of rest of head very pale ochreous, whiter and long on cheeks beneath; antennae entirely black, very long, a little over 10 mm., flagellum crenulated beyond the middle, and its basal joints obscurely longitudinally ridged; fourth antennal joint more than three times as long as third; hair of thorax pale ochreous, orange-rufous dorsally; tegulae reddish; wings almost clear, nervures very dark brown, second submarginal cell considerably broader than high; legs black, with whitish hair; abdomen black, with pale ochreous hair all over, but longest on the first two segments.

Hab. Banning, California. (Dr. A. Davidson). Easily known by the black face and labrum, hairy body, and very long black antennae.

***Melissodes menuacha*, Cresson, var. *semilupina*, n. var.**

Male. Length 11 to 12 mm.; similar to male *menuacha*, and with yellow spots on mandibles, but with the labrum not black at sides, and the red of the antennae darker. In Fowler's table it runs to *M. lupina*, Cresson, and it has the color-characters observed by Mr. Viereck to separate *lupina* from typical *M. agilis*, but it is quite too large for *lupina* or *agilis*. It is, in fact, the Southern California representative of *menuacha*, distinguished from the *agilis* forms by its larger size. A second specimen, also referred here, is a little smaller than the one just described, and has the fourth antennal joint shorter.

Hab. Los Angeles, California, (Dr. A. Davidson).

Melissodes actiosa, Cresson, (or n. sp?)

Male. Length about $9\frac{1}{2}$ mm.; clypeus yellow, with the sides broadly black; labrum black with a large round yellow spot; mandibles black; antennæ very long, and entirely black; mesothorax and scutellum dull black, not punctured; pubescence long but scanty, sordid whitish; tegulæ dark rufous; nervures dark, second submarginal cell broader than high, third abruptly truncate, and narrowed at least half to marginal; abdomen without bands, hind margins of segments narrowly rufescent; short lateral spines on sixth segment, none on fifth; hind tibiæ with conspicuous raised points.

Hab. Lancaster, California, one male with the pubescence largely worn off, collected by Dr. Davidson. **M. actiosa** has hitherto been described only in the female, and the reference of the present male to it must be regarded as provisional. If this is not the male of **actiosa**, it is a new species.

Melecta californica, Cresson.

Bear Valley, three specimens, collected by Dr. Davidson.

Zacosmia maculata, (Cresson).

Strawberry Valley, one collected by Dr. Davidson.

Halictus farinosus, Smith.

Larger than the next species, with reddish tegulæ. Los Angeles, (Davidson).

Halictus titusi, Crawford.

Tegulæ dark. Los Angeles, (Davidson). This species is allied to **H. pacificus**, Ckll., but the plications of the base of the metathorax are much finer. I have a specimen from Mr. Crawford.

Diadasia rinconis opuntiae, Ckll.

Los Angeles, (Davidson).

Anthophora curta, Provancher.

Los Angeles, (Davidson).

Anthophora maculifrons, Cresson.

Bear Valley, (Davidson). The females of this and the last, both small species, may be distinguished thus:

Vertex and occiput with pale ochreous (not black) hair;
 flagellum red beneath**maculifrons**
 Vertex and occiput with black hair; flagellum dark; basal
 half of second abdominal segment nude.....**curta**

Anthophora gohrmanæ, Ckll.

Los Angeles, two (Davidson). Abdomen faintly metallic, without conspicuous hair-bands. Previously known only from New Mexico and Colorado.

***Anthophora urbana*, Cresson.**

Redondo, (Davidson). Also at Los Angeles.

***Anthophora urbana*, Cresson.**

Los Angeles, (Davidson). The male is known from that of **edwardsii** and **angustior** by having only black hair on the second dorsal abdominal segment, and also from **edwardsii** by the deep lateral notching of the yellow of the clypeus.

***Synhalonia angustior*, (Ckll.)**

Los Angeles, (Davidson). Described as a variety of **edwardsii**, but apparently a valid species. One specimen from Los Angeles has pale hair-bands on segments 4 and 5 of abdomen; it may represent a distinct species, but I think not.

***Melissodes lupina*, Cresson.**

This Californian species has remained unknown to me, but from a study of Cresson's description, I came to the conclusion that it was doubtfully distinct from **M. agilis**. Mr. Viereck, at my request, has kindly compared the types of the two species, and reports as follows:

"I can see no tangible specific difference between **melissodes agilis** and **lupina** other than color. The former has the nervures and the margins of the abdominal segments pale, the nervures amber-testaceous to brownish-testaceous, the borders of the abdominal segments whitish testaceous; in the latter these parts are dark, brown or brownish."

***Colletes californica*, provancher.**

Male. Length about 8 mm., black, with long pale yellowish-grey hair on face and thorax, and black hair on upper part of head, cheeks, pleura, abdomen and legs, except anterior femora, which have very long pale hair beneath; head broad above, rapidly narrowing below; mandibles grooved, bidentate, slightly reddish apically; labrum prominent, shining, with four slight apical depressions, producing a crenulate appearance in some lights, but invisible in others; antennæ black, the flagellum faintly brownish beneath; mesothorax closely punctured, with a shining median area; dorsal area of metathorax very narrow (antero-posteriorly), divided by little ridges into more or less square areas; tegulae dark, wings faintly dusky, with the stigma and nervures very dark; second recurrent nervure with a moderate double curve; second submarginal cell very broad, especially below, with the first recurrent nervure entering about the end of its first third; basal nervure falling some distance

short of transverse-medial; middle and hind femora, and their tarsi, more or less dark reddish. Malar space very short, more than twice as broad as long.

Hab.—Los Angeles, California. (Dr. Davidson).

C. nigrifrons, Titus, has darker wings, with the first recurrent nervure entering the second submarginal cell much nearer the middle, as well as other differences. **C. pascoensis**, Ckll., is larger, and has light as well as dark hair on the abdomen. This certainly appears to be the species very briefly described by Provancher. The species which I collected at La Jolla, and which was described in detail by Mr. Viereck as **californica**, appears to require a new name, as follows:

Colletes gandialis, n. sp.

Colletes californica, Viereck (not Prov.), Proc. Acad. Nat. Sci., Phila., 1902, p. 730.

Hab.—La Jolla, Cal. (Cockerell.)

Colletes angelicus, n. sp.

Male. Los Angeles, California, (Dr. A. Davidson).

In table of New Mexico species (Bull. Denison Lab.) runs to **C. texana**, Cresson, but differs greatly by the ochreous pubescence, well-punctured first abdominal segment, etc. In Robertson's Illinois table it runs to the neighborhood of **C. compactus** and **inæqualis**. From **C. inæqualis** it is readily known by its smaller size and broader hair-bands of abdomen; from **C. compactus** by the ochreous pubescence, and much shorter malar space. In Swenk's table of northwestern species it runs out because of the dark thoracic hairs. In Morice's table of European species it runs nearest to **C. fodiens**, Kirby, though the tarsi are normal and the sixth ventral plate is not carinated. (The carina in **fodiens** is not very strong.) The first abdominal segment is not nearly so strongly and coarsely punctured as in male **fodiens**.

Compared with **C. ciliata**, Patton, the abdominal bands are much broader, and not so white. Its characters in further detail, are as follows:

Length just over 10 mm.; black, even to the tarsi, the claws, and the apical part of claw joints, ferruginous; pubescence abundant, light ochraceous dorsally, white or nearly so ventrally, mesothorax and scutellum with some black or dark brown hairs mixed with the others, and not conspicuous; hair of face dense, decidedly yellowish; dorsal abdominal hair-bands dense and very broad (as broad as in the female of **C. hylæiformis**, Eversm., but otherwise quite different, consisting of shaggy

hair); discs of intermediate dorsal segments with inconspicuous but long hairs; ventral segments with white marginal fringes; antennæ stout, black, the flagellum dark brownish beneath; joints much longer than wide, fourth considerably longer than third; malar space broader than long, but not greatly so; labrum shining, with a swelling on each side of the middle; mesothorax closely and strongly punctured, with shining spaces in the middle anteriorly and posteriorly; prothorax laterally pointed, but not spined; metathorax truncate, the base with a series of large pits separated by ridges; legs slender; abdomen shining but well punctured.

(To be continued.)

A DERMOID CYST

BY C. A. WHITING, SC. D., D. O.

A Dermoid cyst, which was removed from a femlæ patient 47 years of age, in a hospital in this city, was recently brought to me for examination. Its weight was 142 grams, or about 5 ounces, and its greatest length was $31\frac{1}{2}$ c.m. (seven inches), its breadth being $7\frac{1}{2}$ c.m. (three inches). The tumor was located in the pelvis and involved both the fallopian tube and the ovary, on the right side. The latter was enlarged to twenty times its normal size. This enlargement was partially due to cysts, enclosing a serous fluid, and in part to the formation of new tissue. The new tissue was connective tissue composed of embryonal cells intermingled with numerous cells of striated muscular tissue. The tumor consisted of two well defined parts.

The smaller part, which was about 11 c.m. ($4\frac{1}{2}$ inches) long, $3\frac{1}{2}$ c.m. ($1\frac{1}{2}$ inches) wide, and $1\frac{1}{2}$ c.m. ($\frac{3}{4}$ of an inch) thick, was composed of epithelium and connective tissue cells enclosing fatty globules, and detritus resembling disintegrating bone. This mass was made coherent by a quantity of long, light colored hair which permeated every part of it. Some of the hairs were more than two and a half feet in length. They appeared to rise in most cases from hair follicles, which presented no essential variation in structure from the normal type. Among these a few well developed sebaceous glands were found.

The larger part of the tumor was nearly globular in form, about 6 c.m. ($2\frac{1}{2}$ inches) in diameter and consisted of bone and cartilage as well as fibrous connective tissue, and epithelial tissue, enclosing fatty detritus. In this portion well developed

teeth were found in the epithelial and osseous tissues. Both incisors and premolars were represented in the dentation, and as is very unusual in Dermoid tumors, at least one of the incisors belonged to the milk dentation. This was indicated not only by the size and shape of the tooth, but also by the fact that the root had been almost wholly absorbed. Giant cells were found in abundance around the root of this tooth. All of the teeth were held in place by alveolar processes more or less perfectly developed. Aside from the tissues named, all of which belonged to the outer and middle germinal layer, there was one piece which somewhat resembled a portion of an intestine in gross structure, though the minute structure did not bear out this interpretation.

The origin of Dermoid tumors has not yet been satisfactorily explained. So far as this particular one is concerned, it is quite possible that it was a twin of the patient which for some reason suffered an early arrest of development, and which subsequently became enclosed in the body cavity of the patient (or twin sister). Here it remained in a quiescent condition for years until it was stimulated into a sudden growth by some change which affected the metabolism of the patient.

SHALL WE PERMIT THIS?

There is in preparation by the recognized authority in this region, a monograph of local importance, which not to publish under the auspices of this Academy will be positively disgraceful. By the exercise of a little effort and some show of generosity, the paltry sum necessary for this purpose can be readily obtained. The author, the editor and others are giving freely of costly time and labor. Must we let this opportunity pass for lack of interest among our membership? As before remarked, there is an abundance of valuable scientific work being done at our very doors and the Southern California Academy of Sciences is compelled to let it go elsewhere for lack of means to publish it. **It is shameful to let this continue.**

Flora of Clifton, Arizona. III.*

BY A. DAVIDSON, C. M., M. D.

ZYGOPHYLLACEÆ.

- Tribulus grandiflorus* B. & H. Widely distributed. Sept.
Tribulus maximus L. Very common. Sept.
Tribulus terrestris L. Lordsburg.
Peganum mexicanum Gray. Local at Clifton.
Larrea mexicana Moric. Common at 4,000 ft. alt.

GERANIACEÆ.

- Geranium cæspitosum* James Metcalf. Sept.
Erodium texanum Gray. Clifton. April.
Oxalis violaceæ L. Metcalf. Sept.

RUTACEÆ.

- Thamnosma texana* Torr. Longfellow. April.
Ptelea baldwinii T. & G. Stream banks above 4,000 ft. alt.

ANACARDIACEÆ.

- Rhus copallina* L. Metcalf. Not found in fruit.
Rhus glabra L. Metcalf. May.
Rhus canadensis trilobata Gray. Freely distributed and variable.
Rhus microphylla Engelm. Ward's Canyon. May.

RHAMNACEÆ.

- Ceanothus fendleri venosus* Trelease. Above Metcalf. Sept.
Ceanothus greggi Gray. Metcalf. Sept.
Sageretia wrightii Wtas. Blue River. Sept.
Rhamnus californica betulæfolia Trelease. Blue River.

SAPINDACEÆ.

- Sapindus drummondi* H. & A. Higher ravines.
Acer grandidentatum Nutt. Metcalf.
Acer negundo L. Blue River.

POLYGALACEÆ.

- Monnina wrightii* Gray. Rocky hillsides. May.

VITACEÆ.

- Vitis arizonica* Engelm. Frequent above 4,000 ft. alt.

*Continued from Page 18, Vol. IV, No. 1, January, 1905.

LEGUMINOSÆ.

- Amorpha californica* Nutt. Moist ravines.
Lotus brachycarpus Benth. On dry ridges. April.
Lotus strigosus Nutt. Dry banks.
Lupinus concinnus Agardh. Common. April.
Hoffmanseggia stricta Benth. Common on Lordsburg plains.
Vicia exigua Nutt. Frequent.
Lathyrus polymorphus Nutt. Duncan.
Robinia neo-mexicana Gray. Higher ravines.
Dalea brachystachys Gray. Metcalf and Blue River.
Dalea racemosa Torr. Common on dry banks of Frisco River.
Dalea brachystachya Gray. Rare at Coronado mine. Aug.
Dalea lasiostachya Benth. Metcalf. Sept.
Dalea albiflora Gray. Blue River. Sept.
Pentalastemon candidus Torr. Duncan. Oct.
Rhyncosia texana T. & G. Shady banks, Metcalf. Sept.
Galactia wrightii Gray. Wood road, Metcalf. Sept.
Calliandra humilis Benth. Dry hills. May.
Acacia cuspidata Schlecht. General above 4,000 ft. alt.
Acacia greggi Benth. Not common around Clifton.
Acacia constricta Benth. Common and general.
Prosopis juliflora D. C. Abundant.
Mimosa buncifera Benth. Blue river. Sept.
Cassia armata Wats. Common and general.
Cassia bauhinioides arizonica Robinson. Johnson's Ranch.
 Sept.
Cassia leptadenia Greenmna. n. sp. Guthrie. Johnson's
 ranch on the Blue river is the type locality. It
 is found in scattered patches on the dry hillsides
 there and at Guthrie. Sept.
Desmanthus jamesii T. & G. Blue river. Sept.
Desmodium spirale D. C. Blue river. Sept.
Desmodium spirale exiguum Rob. & Greenm. Metcalf, on
 rocky talus. Sept.
Desmodium neo-mexicana Gray. With the last.
Desmodium batocaulon Gray. Wood road, Metcalf.
Phaseolus angustissimus Gray. Dry banks, Coronado. Sept.
Phaseolus acutifolius tenuifolius Gray. Common on Chase
 Creek. Oct.
Astragalus purshii Dougl. Common. April.
Astragalus cobrensis Gray. Metcalf, Coronado. May.
Astragalus nuttallianus tenuifolius Gray. Hills and washes.
 April.

BULLETIN

OF THE

Southern California Academy of Sciences

COMMITTEE ON PUBLICATION

THEO. B. COMSTOCK, S. D.; A. DAVIDSON, C. M., M. D.; WM. H. KNIGHT.

CONTENTS:

Page	Page
Now or Never (Editorial).....37	
Transactions for February, 1905.....38	
Academy, Sections Biology, Astro- nomy.....38	
Geology, Botany.....40	
Publications Received.....41	
Publications Reviewed.....41	
	List of Butterflies Found Within the Area of Southern California. By Professor J. J. Rivers.....42
	A Preliminary Synopsis of the South- ern California Cyperaceae, VII. By S. B. Parish.....51

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NOW OR NEVER!

Gradually the Academy is gaining in membership and in power for good in this region; not by any means as much as it ought nor as aggressively as is proper, but a strenuous observer can detect faint signs of movement in the right direction.

If we were only doing our best and aiming for the highest accomplishment we might rest content. But there is need of more zeal and more attention to enlisting young blood into the organization.

Our field is being exploited too much by foreign money and energy; we appreciate too little the value and scientific importance of what lies at our own doors.

Some of our best talent has been tempted away by more generous treatment from outside. We hardly realize, as a community, the honors which come to us in the selection of this region as the observation point of the world's noted astronomers. We have sat complacent while our archæologic treasures have been filched from under our noses, unobserved by our eyes.

The Southwest Society of the Archæological Institute of America is awake and doing something. Let us awake to our duty and our opportunity.

TRANSACTIONS FOR FEBRUARY, 1905.

I. ACADEMY SESSION.

Los Angeles, California, Feb. 6, 1905.

The regular monthly meeting of the Southern California Academy of Sciences was held this evening in the State Normal School. President Dozier occupied the chair.

A lecture of unusual interest was delivered by Prof. J. F. Chamberlain of the State Normal School, his subject being "Some of the Social and Commercial Phases of Geography." In this lecture Prof. Chamberlain showed clearly the new departure which has recently been inaugurated in the teaching of geography in our schools. The lecture furnished material for an animated discussion at its close.

There being no further business, the meeting soon adjourned.

B. R. BAUMGARDT, Secretary.

II. MEETINGS OF SECTIONS.

1. Section of Biology.

The meeting, held February 13, 1905, was called to order by the Chairman of the Section.

Voluntary reports were offered by Profs. Ulrey and Whiting on some peculiarities of cell structure.

The minutes of the last meeting were read and approved.

The lecture of the evening was delivered by Dr. Edith Clappole on "Some Aspects of Cellular Chemistry." The lecture was a clear explanation of many of the most important features relating to the metabolism of the cell. It was of such a character that a synopsis which could be given in this place would be wholly unsatisfactory.

The next lecture before this section will be given by Dr. William Bebb on "The Teeth of Man and Related Animals."

C. A. WHITING, Secretary.

2. Section of Astronomy.

On February 20, the Astronomical Section of the Academy met at the usual place and hour, Chairman Knight presiding.

After some general announcements of meetings, the Chairman introduced the speaker of the evening, Dr. Theodore B. Comstock, who proceeded to review from the standpoint of a geologist an article in "Nature" relative to the investigations of the moon by Prof. W. H. Pickering.

The address, which manifested much careful thought and no little research, presented the various theories of the earth's formation, and applied the same theories to the moon, with a view of establishing a comparison between the genetic conditions of earth and moon.

The moon is the largest of the satellites, in comparison with its principal, being about one-eighty-first of the earth's mass and perhaps one-fiftieth of its volume.

The earth is made up of successive layers, the atmosphere, the hydrosphere, the lithosphere, and the successive layers of matter of varying density beneath the outer lithosphere.

This outer sphere is of an average density about one-fourth that of steel.

The density increases with the depth, and it is estimated that the average density of the interior will equal two and one-half times that of steel.

The earth acts like a solid body, and not like one of liquid interior.

It is held that the rock forming the central portion has a melting point that varies with the pressure, just as water under different degrees of pressure has a different boiling point.

According to this theory, the earth's core could easily be solid, and the densest portion of its mass.

The central rock-matter is complex, not simple. Under the intense heat and pressure that prevails in the interior, all earth material has been fused and squeezed into a conglomerate mass.

The land formation on the earth's surface is due to movements in the outer crust, producing superficial unevenness. Were the earth a perfect sphere, it would be covered with a layer of water about two miles deep.

Three theories are given to account for the solidifying of the earth:

First. The nebular hypothesis, which teaches that the planets and satellites having been successively thrown off from one great central nebulous mass, condensed from nebulous rings into globes, and solidified gradually by cooling on the surface; the cooling process gradually approaching the center, leaving the earth composed of a hard crust of uncertain depth, enveloping a molten interior.

Lord Kelvin has estimated that according to this theory it would have required six hundred million years for the earth's crust to have solidified to the depth of two or three miles. The theory is not generally held by geologists.

Second. The solidification from the center outward, caused by the intense pressure, which is greatest at the center, and which greater pressure would also be the cause of greater heat at the center.

Third. The "planetesimal" theory of Prof. Chamberlain of Chicago University, which holds that nebulous matter revolving about orbital centers collects other similar material, revolving about the same or a neighboring center, and in the course of time a planet or satellite is thus formed by accretion from without.

According to the first theory, mountains are formed by a contraction of the outer crust due to cooling, and volcanoes by the expansive force of the inner heat, breaking through the crust at the weakest points, and giving vent to the molten mass within.

This theory, the speaker thinks, does not sufficiently account for the deep-seated forces necessary to fold the basic rock layers of mountain ranges into the crumpled condition so commonly known to exist.

He leans to the general reasonableness of the theory which supposes the solidification to move from the center outward.

This would force gases and liquids to the surface, where we find them, and might afford a rational explanation of much of geological history difficult to understand. It also appears to account fairly for the phenomena now recognized as radium emanations.

Actual craters on the earth are very small compared with the area covered by the mass of material thrown out of the crater.

The reverse seems to be the case on the surface of the moon, where the opening of the craters seems to be more extensive than the rims formed by the eruptions.

This may be due to the greater distance over which the material in the moon is spread, due to the diminished gravity that resisted its movement when thrown out.

It is believed by some that changes on the surface of the moon are now in progress, though on comparatively small scale.

Prof. Pickering holds that there are evidences of hoar frost, forming during the long and intensely cold lunar night, and melting or evaporating during the equally long and proportionately hot lunar day. This presupposes water in at least small quantities, and gives a basis for the existence of a low form of vegetable life, evidences of which he thinks exist in the varying tints of certain portions of the moon's surface during the exposure to sunlight.

The discussion of the subject at the close of Dr. Comstock's remarks was participated in quite generally and involved a wide range of thought.

MELVILLE DOZIER, Secretary.

3. Section of Geology.

The Geological Section of the Academy met on Monday evening, February 27, at 8 p. m., at the State Normal School Building.

The meeting was called to order by the Chairman, George W. Parsons.

Prof. Robert E. Ford, of the Throop Institute, was then introduced, and gave a very interesting lecture on "How We Get Our Iron and Steel."

He traced the industry back to 1619, in Virginia, where the first iron was manufactured, but afterwards Pennsylvania became the center of the iron industry. He stated that iron ore is found in almost every State, although the bulk of the ores used in this country are now produced in New York, Alabama, Wisconsin and the Lake Superior region.

These ores consist of soft and hard hematite, magnetite and carbonate.

With lantern slides he showed how the largest steamers are loaded for shipment in two hours by machinery, though commonly unloaded by hand.

Questions were asked by the audience. The Secretary exhibited some specimens of hematite crystalization.

G. MAJOR TABER, Secretary.

4. Section of Botany.

This Section met February 21 at 544 Wilcox Building, Dr. A. Davidson in the Chair.

The meeting was devoted to the consideration of the recent additions to the County Flora. Mr. S. B. Parish has reported in the Botanical Gazette the following:

Centaurea cyanus L. Race track Los Angeles (Nevin).

Psilocarpus tenellus Nutt. Near Glendale (Braunton).

Chenopodium leptophyllum Nutt. Lang (Nevin).

Sparganium greenii Morong. Near Ballona (Grant).

The Chairman reported the finding of **Lotus parviflorus** Greene in San Gabriel Canyon and **Mentzelia congesta** at Mt. Wilson.

COLTON RUSSELL, Secretary.

PUBLICATIONS RECEIVED.

Parergones del Instituto Geologico de Mexico. Tomo I, No. 6. Estudio de la Hidrologia Interna de los Alrededores de Cadereyta Mendez, Estado de Queretaro, Por El Ingeniero de Minas Juan De D. Villarello.

Maine Agricultural Experiment Station. Bulletin No. 112. Potato Experiments in 1904. Four Papers by Chas. D. Woods. Circular No. 212. February, 1905. The Cottony Grass Scale. By Edith M. Patch.

University of California Publications:

Astronomy. Lick Observatory Bulletins.

No. 68. Third Series of Observations of the Satellites of Saturn.

No. 69. Elliptic Elements and Ephemeris of Comet e 1904 (Bordly).

No. 70. The Variable Radial Velocity of Sirius.

No. 71. The Orbit of B 395-Ceti 82.

Geology. Bulletins. Vol. 4.

No. 3, pp. 39-87, Pls. 6-7. A Geological Section of the Coast Ranges N. of the Bay of San Francisco. By Vance C. Osmont.

No. 4, pp. 89-100, Pls. 8-11. Areas of the California Neocene. By Vance C. Osmont.

No. 5, pp. 101-123, Pls. 12-13. Contribution to the Palæontology of the Martinez Group. By Charles E. Weaver.

Carnegie Museum (Pittsburgh) Publications: Annals. Vol. III, No. 2, March, 1905. (Serial No. 33). Prize Essay Contest, 1904. (Serial No. 34).

Parergones del Instituto Geologico de Mexico. Tomo I, Numero 7. Estudio de una Muestra de Grafita de Ejutla, Estado de Oaxaca. Por El Ing. J. D. Villarello. Analisis de las Cenizas del Volcan de Santa Maria, Guatemala. Por El Ingeniero E. Ordonez.

Ontario Bureau of Industries: Crop Bull. No. 87. Ontario Dep't. of Agriculture. Nov., 1904.

Mining Magazine. March, 1904. Coal Number.

PUBLICATIONS REVIEWED.

Tomo I, No. 6, of Parergones del Instituto Geologico de Mexico contains a paper on Internal Hydrology of the district surrounding the City of Cadereyta Mendez, in the State of Queretaro. Senor Villarello gives a detailed account of the geology and physical features, with especial reference to the courses, qualities and availability of the underground water currents. His conclusions are not encouraging for the occurrence of extensive supplies of potable water under the area investigated.

The Coal Number (March, 1905) of the Mining Magazine keeps up the record heretofore attained by this excellent periodical.

LIST OF BUTTERFLIES FOUND WITHIN THE AREA OF SOUTHERN CALIFORNIA.

By Professor J. J. Rivers.

The arrangement adopted was published by the National Museum, 1902, and compiled by Dr. Dyar, assisted by the foremost Lepidopterists, which will ensure its being a standard for a long period.

FAMILY PAPILIONIDÆ (Swallowtails.)

Papilio Linn.

1. **P. daunus** Boisd. W. H. Edw. Butt, N. Am. 1874
This species is found sparingly from the coast to the foothills in arborescent localities. The food plants are *Prunus* and *Salix*. The eggs are deposited singly.
2. **P. eurymedon** Boisd. W. H. Edw. Butt, N. Am. 1874
Common in the canyons from the coast to the mountains where in the latter localities it is to be found all the year (Fordyce Grinnell) Larva on *Frangula californica*.
3. **P. rutulus** Boisd. H. Edwards; Proc. Cal. Acad. Sci. 1873
Common all over California appearing fresh during March and April near the coast and again fresh in summer, but according to the record of Fordyce Grinnell, the species occur all the year round in the mountain canyons. Eggs are laid singly on *Prunus* and *Salix* and upon *Alnus rhombifolia*.
4. **P. zolicaon** Boisd. Ann. Soc. Ent. Fr. 1852
Frequent at lower elevations; common at the Soldiers' Home, Santa Monica, (Albright). Eggs laid singly on Umbelliferous plants, particularly *Foeniculum vulgare*, Ger.
5. **P. indra** Reak. Proc. Ent. Soc. Phila.
Not common but frequent in the higher mountains during June. (Grinnell).
6. **P. pergamus** H. Edwards. Proc. Cal. Acad. Sci. 1874
The author places this close to **Indra** but having tails as long as **asterias** Habitat; Santa Barbara, Cal.

FAMILY PIERIDÆ (The Whites.)

Pontia, Fabricius (*Pieris*, Schranck).

7. **P. beckeri** W. H. Edw. Butt, N. Am. 1871
Occasionally taken in overgrown fields south of Pasadena (Grinnell); at Soldiers' Home, (Albright) Pasadena, (Herr).
8. **P. sisymbri** Boisd. Ann. Soc. Ent. Fr. 1852
Fairly common in waste places around Pasadena in early spring (Grinnell).

9. **P. occidentalis** Reak. Proc. Ent. Soc. Phila. 1866
Fairly common at Pasadena. (Grinnell).
10. **P. protodice** Boisd. & LeConte. Lep. Am. Sep. 1833
This species is quite common in many localities. The first brood of the season (**P. vernalis** of authors) continues, in some years, till the typical form appears.
11. **P. rapæ** Linn. Syst. Nat. 1758
Too common despoiling cabbage, Nasturtium, Mignonette and many other garden products.
Nathalis Boisd. (The Yellows).
12. **Nathalis iole** Boisd. Spec. Gen. 1. 1836
Rather common in certain years, locally, from 1,000 to 2,500 ft. Formerly common at the north end of Santa Monica, which ranges about 200 ft. above sea level.
Synchlœ Hubner.
13. **S. creusa** Doubly & Hewit. Gen. Diurn. Lep. 1847. Southern Cal. (Dyar).
14. **S. ausonides** Boisd. Ann. Soc. Ent. Fr. 1852.
Occurs in March and April in canyons but not very common.
15. **S. cethusa** Feld. Reise Novara. Lep. 1865
In canyons, but not common. March and April. (Grinnell).
16. **S. sara** Boisd. Ann. Soc. Ent. Fr. 1852
Common everywhere. Var. **reakirtii** Edw. appears later with the above species; also sulphur colored females. Santa Barbara, Feb. 6 and March 12.
Callidryas Bois. & LeConte.
17. **C. eubule** Linn. Sys. Nat. 1766
This beautiful butterfly is common in S. Cal. Very common in Santa Monica, where the larvæ defoliate the handsome **Cassia floribunda** of the gardens. It is continuously brooded.
Zerene Hubner.
18. **Z. eurydice** Boisd. Ann. Soc. Ent. Fr. 1855
Common in the warm canyons in June; Eagle Rock and canyons of San Gabriel Mts. (Grinnell.) **Z. amorphæ** var. Hy. Edw. Occasional at Pasadena. (Herr). The first brood occurs in Santa Monica canyon as early as the 2nd of March, 1905.
19. **Z. cæsonia** Stoll, Suppl. Cramer. Pap. Exot. 1790
Rare. Taken by F. Grinnell in Arroyo Seco Canyon.
Eurymus Swain. **Colias** Fab.
20. **Z. eurytheme** Boisd. Ann. Soc. Ent. Fr. 1852
Common all over S. Cal. nearly all the year; together with the seasonal forms of **Ariadne** Edw. and **Keeway-**

din Edw., and like the type common. Also occasionally the **albino** var. of the female.

21. **E. harfordii** Hy. Edwards. Pac. Coast Lep. 1877
Common at Altadena and in the mountain canyons. (Grinnell.)
Pyrisita Butler, Cist. Ent. 1870.
22. **P. mexicana** Boisd. Spec. Gen. 1836
Occasionally taken near Pasadena. (Herr.) (Franklin.)
Eurema Hubner.
23. **E. nicippe** Cramer Pap. Exot. 1782

FAMILY NYMPHALIDÆ.

Agraulis Boisd. & LeConte.

24. **A. vanillæ** Linn. Syst. Nat. 1758
This beautiful insect abounds in every garden in S. California having a "Passion vine."
Argynnis Fab.
25. **A. coronis** Behr, Proc. Cal. Acad. Sci. 1862
Not common; Santa Monica Mts. (Max Albright.)
26. **A. callippe** Boisd. Ann. Soc. Ent. Fr. 1852
Common during May in localities where *Viola pedunculata* grows. Pasadena, and at Elizabeth Lake. (Grinnell.)
27. **A. semiramis** Edw. Can. Ent. 1886
Not rare in the region about Newhall; (Shooter.) In the high Mts. (Grinnell.)
Lemonias Hubner. Syn. (Melitæa.)
28. **L. chalcon** Doubl. Hew. Gen. Di. Sep. 1847
Occurs near the entrance of Santa Monica Canyon in the middle of April, but a few miles up the canyon it does not appear till the end of May. "May and June in the foothill Altadena. (Grinnell.) There are several ornate aberrations in design in the markings of some specimens, which of course constitute a genuine variety.
29. **L. editha** Boisd. Ann. Soc. Ent. Fr. 1852
Found at Crafton's near San Bernardino by R. Von. Osten Sacken and determined by Dr. H. Behr.
30. **L. augusta** Edw. Can. Ent. 1890
Foothills of San Bernardino Mts.; also at Fresno.
31. **L. gabbii** Behr, Proc. Cal. Acad. Sci. 1863
Common in all canyons from the sea to the Mts. in spring and early summer and on the sand hills at Ocean Park.
Thessalia Scudder. (Syn. Melitæa.)
32. **T. leanira** Boisd. Ann. Soc. Ent. Belg. 1869
Common, but local in foothill canyons.

33. **T. wrightii** Edw. Can. Ent. 1886
Common locally around Pasadena. (Grinnell.)
Phyciodes Hubner. (Syn. Melitaea.)
34. **P. mylitta** Edw. Proc. Acad. Nat. Sci. Phila. 1861
In Arroyo Seco Canyon, but not common. (Grinnell.)
35. **P. montana** Behr, Proc. Cal. Acad. Sci. 1863
In Arroyo Seco Canyon; rare.
Polygonia Hubner. (Syn. Grapta.)
36. **P. satyrus** Edw. Trans. Ann. Ent. Soc. 1869
Common throughout S. California. Larva on Urtica.
Dimorphic form **marsyas**, Edw. Trans. Am. Soc. 1870.
37. **E. californica** Boisd. Ann. Soc. Ent. Fr. 1852
In canyons up to 2000 ft.
Eu Vanessa Linn.
38. **E. antiopa** Linn. Syst. Nat. 1758
This handsome butterfly is almost everywhere, whenever the sun smiles.
Aglais Dalman.
39. **A. milberti** Godart, Encl. Meth. 1819
Occasionally and rare at 1000 ft. alt.
Vanessa Feb.
40. **V. atlanta** Linn. Syst. Nat. 1758
Common to all sections of the U. S. Caterpillar feeds upon nettles.
41. **V. hunter** Fab. Syst. Ent. 1775
Local, but not rare on dry uplands, the caterpillar feeding upon *Gnaphalium californicum*.
42. **V. cardui** Linn. Syst. Nat. 1758
Europe, Asia, U. S. and almost everywhere. The food-plants are thistles, hollyhocks and sunflowers.
43. **V. carye** Hub. Samml. Exot. Schmett. 1825
The commonest all day butterfly in all California. The caterpillar feeds on *Malva parviflora* Linn. There is an occasional variety both in the male and in the female occurring too both in North and South California that should the sexes meet the progeny would be a well marked species. This var. was described by Letcher of San Francisco; under the name **muelleri**. It is rare but uniform in markings, Pasadena, (Herr.) Santa Monica, (Rivers); Berkeley, (Rivers) Mountain View, (Rivers). The first example of this aberration was taken by the late Lepidopterist, Van Ammon of San Francisco.
- JUNONIA** Hubner.
44. **J. coenia** Hub. Samml. Exot. Schmitt. 1825
This species though not rare is local and would be found

generally on open plains where plantago lanceolata grows.

Basilarchia Seudder. (Limenitis.)

45. **B. lorquini** Boisd. Ann. Soc. Ent. Fr. 1852.

Common in canyons among willows.

Limenitis. Fab.

46. **L. Bredowii** Hub. Zutr. Exot. Schmett. 1837

Common about Quercus up to 5000 ft. alt., (Grinnell.) It is greatly attracted by the flowers of Aesculus californicus (Buckeye.)

FAMILY AGAPETIDÆ.

Cercyonis Speyer

47. **C. sthenele** Boisd. Ann. Soc. Ent. Fr. 1852

Common in bushy places in the mountains. (Grinnell).

Coenonympha Huber

48. **C. californica** Oub. & Hewet. Syn Glanactinus, Boisd

Common in grassy places during spring and summer.

49. **C. ochracea** Edw. Proc. Acad. Nat. Sci. Phila. 1861

Southern Cal. Appears in the spring.

FAMILY LIMNADIDÆ.

Anosia Huber.

50. **A. plexippus** Linn. Syst. Nat. 1758

Common everywhere.

51. **A. berenice** Cramer, Pap. Exot. 1782

Appears late in summer in the Santa Monica Canyon; Local at Pasadena. (Grinnell.)

FAMILY RIODINIDÆ.

Chrysobia Boisd.

52. **C. virgulti** Behr, Proc Cal. Acad. Sci. 1865

Common about hillsides, Santa Monica Canyon; in arroyos and bushy Mts. (Grinnell.)

Calephilis Grote & Robinson.

53. **C. nemisis** Edw. Trans. Am. Ent. Soc. 1871

Common in shrubby places Santa Monica Canyon; Arroyo Seco, Wilson Lake. (Grinnell.)

FAMILY LYCÆNIDÆ.

Habrodus Seudder. (Thecla)

54. **H. grunus** Boisd. Ann. Soc. Ent. Fr. 1852

Common in Santa Monica Canyon, where Quercus agrifolia grows; but Fordyce Grinnell finds it in the region of Q. chrysolepis is 4500-600 ft. alt.

Hypaurotis Scudder (Thecla.) The Hairstreaks.

55. **H. crysalis** Edw. Trans. Am. Ent. Soc. 1873

Rare; taken in June at Castaic Ranch, Newhall, feeding on the flowers of *Brassica nigra*. (Shooter.)

Atlides Cramer.

56. **A. halesus** Cramer, Pap. Exot. 1779

Not common and local. The flowers of *Heteromeles arbutifolia* attract this butterfly. The food plant of the larva is the oak mistletoe *Phoradendron flavescens*. "Rare; Arroyo Seco" Grinnell.

Uranotis Scudder. (Thecla of authors.)

57. **U. melinus** Hub. Zutr. Exot. Schmitt. 1818

Common almost all the year and is found over the U. S. Larva on Leguminous plants.

Thecla Fab. (The Hairstreaks.)

58. **T. californica** Edw. Proc. Acad. Nat. Sci. Phila. 1862

Mt. Lowe; Arroyo Seco; Mt. Wilson. (Grinnell.)

59. **T. dryope** Edw. Trans. Am. Ent. Soc. 1870

Common on manzanita on mountains at 5000 ft. alt.

60. **T. spadix** Hy. Edw. Pap. 1. 53. 1881

Not common. Occurs at about 4500 ft. alt. Mt. Lowe; Mt. Wilson; Arroyo Seco Canyon. (Grinnell.)

61. **T. saepium** Boisd. Ann. Soc. Ent. Fr. 1876.

Common Santa Monica Mts., and all through the foothill country.

62. **T. nelsonii** Boisd. Ann. Soc. Ent. Belg.

Rare; San Bernardino Mts.

63. **T. adenostomatis** Hy. Edw. Proc. Acad. Sci. 1876

Very common in the canyons of the San Gabriel Range. (Grinnell.)

Incisalia Minot. (Thecla of authors.)

64. **I. iroides** Boisd. Am. Soc. Ent. Fr. 1852

Common in arroyos and foothills. (Grinnell.)

65. **I. eryphon** Boisd. Ann. Soc. Ent. Fr. 1852

Santa Monica Mts. Not common.

Callophrys Billberg. (Thecla of authors.)

66. **C. dumetorum** Boisd. Ann. Soc. Ent. Fr. 1852

Common among shrubs from the bluffs of the seacoast to the mountains.

Tharsalea Scudder. (Thecla of authors.)

67. **T. arota** Boisd. Ann. Soc. Ent. Fr. 1852

Canyons 1,500 ft., Santa Monica Range. (M. Albright.)

Gaeides Scudder. (Chrysophanus.)

68. **G. xanthoides** Boisd. Ann. Soc. Ent. Fr. 1852

On helianthus; Eagle rock. (Grinnell.)

69. **G. gorgon** Boisd. Ann. Soc. Ent. Fr. 1852
Not common. Arroyo Seco; Mt. Wilson. (Grinnell.)
Epidemia Scudder.
70. **E. helloides** Boisd. Ann. Soc. Ent. Fr. 1852
Common from the sea to the mountains. Very common,
Wilson's Lake; Arroyo Seco. (Grinnell.)
Cupido Schrank. (Lycaena.)
71. **C. lycea** Edw. Proc. Ent. Soc. Phila. 1864
Mt. Lowe. (J. E. Brown.)
72. **C. pheres** Boisd. Ann. Soc. Ent. Fr. 1852
In canyons, local.
73. **C. icarioides** Boisd. Ann. Soc. Ent. Fr. 1852. Syn. **pardalis**
Baird. Behr. **daedalus** Behr: **mintha** Edw.
Nomiades Scudder. (Lycaena) The Blues.
74. **N. antiacis** Boisd. Ann. Soc. Ent. Fr. 1852. Syn. **poly-**
phemus Boisd.: **orcus** Edw.: var. a. **behrii** Edw.:
var. b. **mertila** Edw.
Appear in March and April Santa Monica, Canyons of
San Gabriel Mts.; also at Santa Barbara.
Phaedrotes Scudder. (Lycaena.)
75. **P. sagittigera** Felder Reise Novara Sep. 1865. Synms.
Catalina: lorquini; rhaea: viaca: duania
Not common. Arroyo Seco, Alhambra. (Fordyce, Grinnell.)
76. **P. speciosa** Hy. Edw. Proc. Cal. Acad. Sci. 1876
Philotes Scudder. (Lycaena.)
77. **P. sonorensis** Felder Reise Novara, Sep. 1865. Syn. **regia**
Boisd.
Occurs commonly along mountain streams in March and
April.
Rusticus Hubner. (Lycaena.)
78. **R. batoides** Behr. Proc. Cal. Acad. Sci. 1867
Common in damp places in moist canyons.
79. **R. melissa** Edw. Trans. Ent. Am. Ent. Soc. 1873
Common in Arroyo Seco. (Grinnell.)
80. **R. acmon** Doub. and Hewiston, Gen. Diurn. Lep. 1852
Common everywhere.
81. **R. neurona** Skinner, Ent. News. 1902
Found only on Barley Flats, altitude 4,000 ft., by Mr.
Hart, Pasadena.
82. **R. chlorina** Skinner, Ent. News. 1902
Frequent in Mts. north of Pasadena. (Grinnell.)

Cyaniris Dalman. (Lycaena.)

83. **C. ladon** Cramer, Pap. Exot. 1782. Syn. Pseudoargiolus Boisd. and LeC.

Everywhere common in March and April, particularly the subspecies **piasus**.

Everes Hubner. (Lycaena.)

84. **E. amyntula** Boisd. Ann. Soc. Ent. Fr. 1852

Not common, but found near willows and streams.

85. **E. monica** Reak. Proc. Nat. Sci. Phila.

Rare; between the rocks of the upper Santa Monica Canyon.

Hemiargus Hubner. (Lycaena.)

86. **H. isola** Reak. Proc. Acad. Nat. Sci. Phila. 1866

Not common; Pasadena. (Grinnell.)

87. **H. hanno** Stoll, Pap. Exot. 1790

Rare; Pasadena. (J. E. Brown.) This species has hitherto been reported from the Gulf States.

Brephidium Scudder. (Lycaena.)

88. **B. exilis** Boisd. Ann. Soc. Ent. Fr. 1852

Abundant on low herbage everywhere. (On Chenopodiaceae. (Grinnell.)

Leptotes Scudder. (Lycaena.)

89. **L. marina** Reak. Proc. Acad. Nat. Sci. Phila. 1868

Common at Santa Monica and north to Santa Barbara June and July.

FAMILY HESPERIIDÆ. (The Skippers.)

Copaeodes Speyer.

90. **C. procris** Edw. Trans. Am. Ent. Soc.

Not common. Near Pasadena. (Herr.)

Anthomaster Scudder.

91. **A. nemorum** Boisd. Ann. Soc. Ent. Fr. 1852

Common Arroyo Seco Canyon and along the coast to Santa Barbara.

92. **A. sylvanoides** Boisd. Ann. Soc. Ent. Fr. 1852.

Not rare in Santa Monica Canyon. Rare at Pasadena. (Grinnell.)

93. **A. agricola** Boisd. Ann. Soc. Ent. Fr. 1852

Not common; Pasadena. May and June. (Grinnell.)

Hylephila Billberg.

94. **H. campestris** Boisd. Ann. Soc. Ent. Fr. 1852

Mountains to the sea. June to Sept., common.

95. **H. phylaeus** Drury, Ill, Exot. Ent. 1770.

Common all the year. (Grinnell.)

Polites Scudder.

96. **P. sabuleti** Boisd. Ann. Soc. Ent. Fr. 1852
Common generally; Santa Monica, July. Pasadena,
Sept. (Brown.)

Prenes Scudder.

97. **P. errans** Skinner, Ent. News. 1892
Common on the sand dunes of the sea shore, and in the
canyons and gardens at Santa Monica. June to Oct.

Phycanessa Scudder.

98. **P. melane** Edw. Trans. Am. Ent. Soc. 1869
First brood Feb. and March and common everywhere
May to August.

99. **Eudamus** species?
Arroyo Seco Canyon; rare, May and August. (Grinnell.)

Epargyreus Hubner.

100. **E. tityrus** Fab. Syst. Ent. 1775
Sparingly in Santa Monica in the upper canyon. July.

Pholisora Scudder.

101. **P. catullus** Fab. Ent. Syst. 1793
Not common, Upper Santa Monica Canyon; April and
May. Pasadena. (Grinnell.)

101. **P. libya** Scudder, Bull. Geolog. Surv. Terr. 1878
Examples taken in the Mojave Desert June 19, 1904.
(Grinnell.)

Thanaos.

103. **T. callidus** Grinnell. Ent. News. 1904
Type from Mt. Wilson; alt. 5,886. June 6.
104. **T. propertius** Lintner, Pap. 1871
Common, Santa Monica, and other localities. June-July.
105. **T. tristis** Boisd. Ann. Soc. Ent. Fr. 1852
Frequent near Pasadena. (Grinnell.)

Hesperia Fab.

106. **H. ericetorum** Boisd. Ann. Soc. Ent. Fr. 1852
Common in upper Santa Monica Canyon; rare in can-
yons near Pasadena. (Grinnell.)
107. **H. tessellata** Scudder, Syst. Rev. 1872
Common everywhere in Southern California. First ap-
pearing in March.

There are 180 butterflies recorded as native to California; not including polymorphic forms, nor any local examples breeding true to type and called races or subspecies. Nor is there any consideration taken of real varieties or sports. Out of these 180 species thus recorded the list for Southern California numbers 107, and this list will be increased yearly as the families of the **Lycænidae** and **Hesperidæ** are investigated.

A PRELIMINARY SYNOPSIS OF THE SOUTHERN CALIFORNIA CYPERACEAE. VII.*

By S. B. Parish.

8. **CAREX** Linn. Sp. Pl. 972. Sedge.

Perennial herbs, with mostly 3-angled leafy culms.

Spikes simple or aggregated, monoecious, dioecious, or androgenous, each subtended by a leafy or scale-like involueral leaf, or bract, or rarely bractless. Flowers solitary in the axils of scales; the staminate of 3 stamens; the pistillate of a single pistil. Perianth wanting. Styles with 2-3 stigmas. Achenes 3-angled lenticular, or plano-convex, completely enclosed in a sac-like bractlet, called the perigynium.

A genus of over 1,000 species; of wide distribution, but most abundant in temperate climates. In Southern California they are most largely represented in the higher mountains, often forming the prevailing herbage of meadows. Most of our species are hydrophytic or mesophytic, but a few are xerophytic.

Two subgenera are recognized:

Staminate and pistillate flowers in separate, mostly simple and elongated spikes.

I. **Eucaryx**.

Staminate and pistillate flowers in the same sessile, mostly short and aggregated spikes.

II. **Vignea**.

Subgenus I. **EUCAREX**, Coss, Fl. Paris, 744.

Staminate flowers in one or more terminal linear or clavate spikes. Pistillate flowers in inferior, simple, pedunculate or sessile spikes. Or the spike solitary and staminate at summit or base, or rarely dioecious. Stigmas mostly 3, and achenes trigonous or triquetrous; or stigmas 2, and achenes lenticular.

One or more of the uppermost pistillate spikes is often staminate at summit, or rarely at base, and one or more of the staminate spikes may be pistillate at base or summit.

KEY TO EUCARYX.

I. Staminate flowers in one or more terminal spikes; pistillate flowers in several inferior sessile or pedunculate spikes.

Perigynia attenuate to a beak one-third as long as the body, or longer.

*Continued from Page 13, this volume, No. 1, January, 1905.

- Pistillate spikes drooping. 2. *C. comosa*.
Pistillate spikes erect.
Perigynia glabrous. 1. *C. utriculata*.
Perigynia hirsute.
Leaves scabrous. 3. *C. lanuginosa*.
Leaves hirsute. 4. *C. Yosemiteana*.
Perigynia short-beaked, or beakless.
Pistillate spikes compactly many-flowered, cylindrical.
Stigmas 3.
Pistillate spikes stramineous, 10-15 cm.
long. 5. *C. spissa*.
Pistillate spikes purplish, or dark brown.
Bracts sheathing at base. 6. *C. ablata*.
Bracts auriculate at base. 7. *C. quadrifida cæca*.
Stigmas 2.
Beaks bidentate.
Apex of scales acicular-toothed. 8. *C. laciniata*.
Scales smooth 9. *C. Nebraskensis prævia*.
Beaks entire-mouthed.
Perigynia ovoid or obovoid.
Pistillate spikes 3-5 cm. long.
Pistillate spikes 2-3, pedunculate. 10. *C. senta*.
Pistillate spike 1, sessile. 11. *C. auriculata*.
Pistillate spikes 6-10 cm. long, sessile. 12. *C. Barbaræ*.
Perigynia ellipsoidal.
Scales lanceolate, obtuse or subacute. 13. *C. austromontana*.
Scales oblong, emarginate or obtuse. 14. *C. Jacintoensis*.
Pistillate spikes loosely few-flowered, green.
Stigmas 2; perigynia pyriform. 15. *C. Hassei*.
Stigmas 3.
Perigynia globose. 16. *C. globosa*.
Perigynia triquetrous. 17. *C. triquetra*.
II. Spikes solitary, staminate above.
Pistillate flowers loosely disposed. 18. *C. multicaulis*.
Pistillate flowers aggregated. 19. *C. filifolia*.

(To be continued.)

The election of members of the Board of Directors which are to be voted upon by the Academy at large, will take place at the State Normal School, Monday, May 1, 1905. Polls open from 6:00 to 8:00 p.m., as required by the Constitution. Failing other nominations, a ticket has been prepared by the present Board, as provided in the Constitution, Article VII, Sec. 2.

BULLETIN

OF THE

Southern California Academy of Sciences

COMMITTEE ON PUBLICATION

THEO. B. COMSTOCK, S. D.; A. DAVIDSON, C. M., M. D.; WM. H. KNIGHT.

CONTENTS:

	Page		Page
Prospects Brighten (Editorial).....	53	Ants from Catalina Island, by Wm. Morton Wheeler.....	60
Transactions for March, 1905.....	54	New Fungi from Catalina Island, by J. B. Ellis and B. M. Everhart.....	62
Academy Directors, Sections of		On San Jacinto Trails, by Blanche Trask.....	63
Biology, Astronomy.....	54	A Preliminary Synopsis of the Southern California Cyperaceæ, VIII, by S. B. Parish.....	66
Geology, Botany.....	55		
Publications Reviewed.....	55		
Notes on the Fauna and Flora of Catalina Island, by C. F. Baker.....	56		

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PROSPECTS BRIGHTEN.

The outlook begins to improve for securing such results as many have been long seeking in the way of more permanent usefulness for the Southern California Academy of Sciences.

Just now there appears some chance of obtaining a favorable connection with the Southwest Museum, which is rapidly assuming concrete form under the representative Museum Foundation Committee of about fifty members. This committee has been thoughtfully chosen by the Executive Committee of the Southwest Society, the local branch of the Archæological Institute of America.

The prestige and cordial support of the parent Institute has been the **motif** and incentive of the movement which now has acquired momentum enough to carry it on to brilliant success. But it is well to emphasize the fact that the results and the hard work are voluntary contributions from busy local men and women for the benefit of the Southwest itself.

It is not a new issue, but the natural growth by accretion—the crystallization, in effect—of countless hitherto unsystematized, though earnest efforts. **God speed the work.**

MAY 25 1905

TRANSACTIONS FOR MARCH, 1905.**I. ACADEMY SESSION.**

Los Angeles, California, March 6, 1905.

The regular monthly meeting of the Southern California Academy of Sciences was held this evening in the State Normal School, President Dozier occupying the chair.

The lecture for the evening was the World's Fair at St. Louis, and was delivered by Mr. B. R. Baumgardt. It was a concise statement of human progress since the Chicago Fair in 1893, showing the great advance made in all branches of science, manipulation of power, transportation, electricity, manufacturing and education. The lecture was illustrated with calcium light views.

B. R. BAUMGARDT, Secretary.

II. BOARD OF DIRECTORS.

Los Angeles, March 6, 1905.

The Board of Directors met this evening at 7:30, at the State Normal School. President Dozier occupied the chair.

The following applicants for membership were elected members: Mr. Harry O. Carter and Mr. W. Scott Lewis.

Several bills were audited.

Adjourned.

B. R. BAUMGARDT, Secretary.

III. MEETINGS OF SECTIONS.**1. Biology.**

March 13, 1905.

Owing to a violent rainstorm, the March meeting of the Biological Section was postponed for one month. C. A. WHITING, Secretary.

2. Astronomy.

The Section met at the usual hour and place on March 20th, Chairman William H. Knight, presiding. The discussion took a wide and somewhat discursive range. By request, Mr. Baumgardt presented the matter of apparent retrograde motion of Venus, explaining by aid of a diagram the cause of apparent retrogression. The planet Venus having just passed the point of greatest elongation, the question of its movement and appearance during the next few weeks was of special interest.

The method of determining its distance from the sun was elucidated, and the various phases assumed during its revolution about the sun.

Mr. Knight then presented some very important things relative to the approaching eclipse of the sun, to occur on August 30th next. At that time the earth will be near its aphelion point and the moon in perigee, both of which facts contribute to the greater width of the zone covered by the moon's shadow on the earth and the greater duration of the eclipse.

Great preparations are being made by astronomers all over the world to make the best possible use of this rare opportunity for studying the sun. Lick Observatory will send out three expeditions, one to Canada, one to Spain, and one to Egypt; the special aim of the observatory being also threefold namely, to search for intro-Mercurial planets, to secure photographs of the corona, and spectroscopic photographs of the chromosphere. The unusual duration of nearly four minutes will make it possible, under favorable atmospheric conditions, to secure excellent results in each of these directions.

The enterprise of the Lick Observatory is made the more striking in comparison with the observatories of Great Britain, which will send

out but one expedition each; but these will go to various points on the earth, and, in the aggregate, will constitute a long line of observers in the path of totality. Mr. Knight gave the dates of a number of solar eclipses to occur during the next decade, and the path that will be traced over the surface of the earth. Mr. Baumgardt added the important and interesting fact that the next solar eclipse that will be visible in California will occur on May 5th, 1918, and the shadow zone will embrace the Lick Observatory.

Some discussion arose relative to the nature of the corona, photosphere and chromosphere of the sun, during which it was mentioned that the identity of the corona and the zodiacal light is now a theory meeting with favor.

MELVILLE DOZIER, Secretary.

3. Geology.

On the evening of the 27th of March the Geological Section of the Academy met at the State Normal School Building. Chairman Geo. W. Parsons presided. Rev. H. B. Gage of Long Beach gave a very interesting talk on the minerals found in Riverside county. He exhibited about fifty specimens he had gathered in the mountains, many of them being quite rare.

G. MAJOR TABER, Secretary.

4. Botany.

(No session of the Botanical Section was held in March, 1905.)

PUBLICATIONS REVIEWED.

In Bulletin (Vol. 4) No. 3, of the Department of Geology, University of California, Mr. Vance C. Osmont discusses "A Geological Section of the Coast Ranges North of the Bay of San Francisco," presenting very valuable data and illustrated sections. The geologic sequence of events is very closely explained and the results are, in some respects, very interesting. The evidence of recent and now progressing subsidence in that region are in marked contrast to the movements of elevation farther southward along the Pacific coast. Some of the author's conclusions as to the relative horizons of terranes exposed go far towards elucidating hitherto little understood structure.

Vol. 4, No. 4, of the foregoing series of Bulletins is another paper by Mr. Osmont, on "Arcas of the California Neocene." This illustrates a number of forms of the genus *Arca* and shows their vertical range, paleontologically, a matter of much importance in the present state of knowledge of the Neocene rocks of California.

Vol. 4, No. 5, same series, is by Chas. E. Weaver, a "Contribution to the Palæontology of the Martinez Group." Mr. Weaver illustrates twenty fossil forms from this terrane, which, from his studies, he places independently, as the representative of perhaps one-quarter of the lowest Eocene, in a position between the Chico and Tejon groups, heretofore taken, in part, as equivalent to the Martinez group.

Annals of the Carnegie Museum (Pittsburgh), Vol. III, No. 2, March, 1905, continues the publication of valuable material historical, zoological, geological and paleontological. A very interesting document also sent out by this museum, as "Serial No. 34," is a succinct account of "The Prize Essay Contest" by pupils of the public schools of Pittsburgh and Allegheny. Despite the worth and interest of this contest, we lack space to do more than mention the subjects of the essays, as an indication of the spirit of the contest and its value as an incentive to profitable thinking along lines of nature study. The titles given are:

1. "A Letter to a Friend About the Carnegie Museum."
2. "Transportation, or the Moving of Loads, as Illustrated at the Carnegie Museum."
3. "Why the Birds Should Be Protected, and What I Learned About Them at the Carnegie Museum."

NOTES ON THE FAUNA AND FLORA OF CATALINA ISLAND.

By C. F. Baker.

(Read before Section of Botany, April 18, 1905.)

During March of 1904, my wife and I had an unexpected opportunity to do a half day's collecting at Avalon, on Catalina Island. We did not collect with any idea of making a contribution to the knowledge of the fauna and flora of the Island, but rather as a matter of habit and for our own pleasure. The fact that Avalon is a great summer resort and often visited by zoölogists and botanists, seemed to render it very unlikely that we should find anything of unusual interest or unknown. However, as the results are gathered together they form a contribution of wholly unexpected interest and importance.

Our collecting was all done within the immediate outskirts of the town. Starting from the hotel early in the morning, we climbed the hill by the church, thence up a little gulch and out on to the hilltop; from here we passed down a larger gulch on the other side, through the golf links, and some distance up a large wash across the valley; lunch time having arrived we returned to the hotel; after lunch, until steamer time we walked along the rocky beach on the north side of the bay. It was early March and the surrounding country looked very bare—sandy hills covered with a few bushes and much cactus—cut by many deep gulches, along the bottoms and south sides of which were some shrubs and grasses still green.

We gathered a number of lichens, which, although of very unusual interest, added nothing to Dr. Hasse's records. Splendid collections might readily be made of the lichens at this point, for they are abundant in species and specimens. It was too early for flowering plants, but their dead twigs furnished a number of interesting fungi. The proportion of new species would indicate a characteristic fungus flora for the Island, and undoubtedly a rich harvest awaits the thorough collector. Under boards and stones occurred a great variety of animal life, from snakes, lizards, and salamanders down to Thy-sanurans, mollusks and worms. It will be impossible at the present time to enumerate all the species taken, since they are not yet all worked up. The spiders furnished a new genus and species and the ants several new forms. The Island seems to have a remarkable ant and spider fauna, and evidently a careful gathering of the species will yield rich returns.

On the shore after lunch, we reveled in crustaceans, collecting numerous Amphipods, Isopods, hermit crabs, etc. Deep in the sand underneath boulders, low down on the beach, we

found a number of the extraordinary crustacean, **Callianassa affinis** Holmes (determined by Miss Rathbun), and under the same boulders specimens of a curious little blind fish. Somewhat higher up on the beach, but still between tides, the boulders furnished great numbers of Isopods. Running about among the Isopods were numbers of Thysanurans, and also numerous individuals of a small, light colored Staphylinid which has proven to be a new genus and species, and which has been named by Casey, **Bryothinusa catalinæ**. Thousands of specimens of this species might have been easily collected at the time we visited the locality. Davenport has found (see Cold Spring Harbor Monographs II) that Thysanurans living between tides did not retreat or float as the tide rose, but burrowed down into the sand. There is an unusually fine chance for a similar study at Avalon—not only in connection with the Thysanurans, but in relation to this curious little **Bryothinusa**.

No attempt was made to carry away the larger and more conspicuous things—numerous collections have been made of these. Fine series of fish, of seaweeds, of birds, and various other groups of animals and plants could easily be taken at this point, and so far as we had opportunity to observe, the marine life—worms, mollusks, echinoderms, etc.—seemed to be abundant.

Below is given an account of some of the things taken, and the ants collected have been kindly worked up for us for publication in the Bulletin by Professor Wheeler, Messrs. Ellis and Everhard likewise describing the fungi obtained.*

FUNGI.

Besides the new species described by Professor Wheeler, the following may also be recorded: **Thyridium lividum** Pers., occurred commonly on the dead stems of **Ramona polystachya** and **Isomeris, arboræ**. Specimens of **Lycoperdon gemmatum** Batsch., were found on mossy banks underneath bushes, and **Geaster hygrometricus** occurred in similar places. An evergreen **Rhus** in the gulches was very commonly affected with a **Harknessia** parasitic on the leaves. The cacti abundant here were very commonly affected with exceptionally fine specimens of a **Phoma** which Dr. Ellis has questionably referred to **Phoma opuntiae**. He remarks that in the Catalina specimens the spores are smaller and of two kinds.

ARACHNIDA.

Two specimens of Drassids taken near Avalon have served as the types of a new genus and species, and have been de-

*These papers follow in this issue of the Bulletin.—(Ed.)

scribed by Mr. Banks in the Proc. Cal. Acad. Sci. 1904, Zööl. Vol. III, p. 334, as follows:

DRASSINELLA Banks, n. gen.

Cephalothorax with short groove; eyes as in *Poecilochroa*, except the S. E. are not their diameter apart, the posterior row being straight and longer than front row, with the M. E. nearer to P. S. E. than to each other. Mandibles slightly geniculate, no large tooth below, only one or two small ones. Legs long and slender; tibiae I and II with two rows, each of five spines, below, the last its length before tip; three such pairs under these metatarsi, hind tibiae with a median and apical pair below, none above; tarsi weakly scapulate; lip rather broader than long; spinnerets not very long.

Drasinella modesta Banks, n. sp.

Cephalothorax, mandibles and legs dull yellowish brown, the latter paler on tarsi; sternum pale yellow-brown, dark on margin; abdomen dark gray above, with black hair; venter gray. Cephalothorax rather short; P. M. E. oval, more than longest diameter apart, a little nearer to nearly equal P. S. E.; A. M. E. about diameter apart, not one-half so far from slightly larger A. S. E. Quadrangle of M. E. much broader behind than in front; S. E. separated by about one-half diameter, equal. Sternum broadest at coxæ II, pointed behind, and but little longer than broad. Under tibiae I and II after the large spines, are several pairs of minute spines. Abdomen nearly twice as long as broad, truncate at base, pointed behind. Length $\frac{3}{8}$ mm.

OTHER ARACHNIDS.

There were also taken near Avalon the following other Arachnids: *Agalena pacifica* Banks, *Lathrodectes mactans* Koch, *Phidippus bicolor* Kays, and the phalangid *Protolophus tuberculatus* Banks.

COLEOPTERA.

In Canadian Entomologist, Vol. XXXVI, p. 312, Major Casey has described

BRYOTHINUSA Casey, n. gen.

Body moderately slender, exactly parallel, rather depressed on the upper surface, the integuments dull, very finely and densely sculptured, the pubescence short, abundant and semi-erect; head strongly deflexed, fully as wide as long, the sides parallel and arcuate, the base very broad and inserted within the apex of the prothorax; eyes small, anterior, flat, elongate-oval, consisting of ten to twelve coarse convex facets; infra-lateral carina wholly wanting; epistoma broadly arcuate; labrum about twice as wide as long, rather prominent, broadly rounded at tip; antennæ long and slender, very feebly incrassate distally, the joints loosely joined, the first and second

elongate and subequal, the second as long as the third and fourth combined; mentum very large, flat, trapezoidal, maxillary lobe long, slender, hooked at tip, loosely serrate within; labial palpi slender, 3-jointed, the maxillary large and well developed, densely hairy; prothorax at apex as wide as the head, gradually and moderately narrowed thence to the base, the sides nearly straight, the hypomera delimited from the pronotum by a very fine beaded edge, broad in the middle and narrowing arcuately to base and apex; scutellum very large, triangular; elytra shorter than the prothorax, the suture not beaded; abdomen more than half as long as the body, parallel, the segments not impressed at base; metasternum very short, the episternum large, gradually and rapidly narrowed anteriorly; legs rather short and stout; coxæ very large, the intermediate acetabula apparently well defined throughout; tibiæ pubescent and finely subspinulose; tarsi short and rather thick, 4-4-5 jointed, the first four joints of the posterior diminishing gradually and slightly in length, the fifth not quite as long as the preceding three combined.

This genus differs from *Thinusa* in its very long antennæ, broad hypomera, small eyes, and in many other characters. The type is the following:

***Bryothinusa catalinæ* Casey, n. sp.**

Pale yellowish-brown in color throughout the body, legs and antennæ, the abdomen feebly clouded with piceous from rather before the middle nearly to the apex, extremely minutely and closely punctulate throughout, the pubescence pale and rather conspicuous; head rather large, flat or broadly impressed above, the antennæ half as long as the body, slender, just visibly incrassate distally, bristling throughout with short and rather stiff erect pubescence, the tenth joint distinctly longer than wide, the eleventh about as long as the preceding two combined, gradually and acutely conoidal; prothorax distinctly wider than long, broadly, feebly concave toward the middle throughout the length, except at the apical margin; base superposed over the base of the elytra, the latter flat bi-obliquely truncate at tip, as wide as the prothorax and four-fifths as long, the sides parallel; abdomen strongly margined, equal in width to the elytra. Length, 2.15 mm.; width, 0.43 mm.

OTHER COLEOPTERA.

The following beetles, kindly determined by Prof. Fall, were all of common occurrence during storms: *Cuchrus mimus* Horn, *Amara insignis* Dej., *Calathus obscurus* Lec., *Platynus maculicollis* Dej., *Euryme topon convexi colle* Lec., *Coniontis elliptica* Casey, *Nyctoporis carinata* Lec., *Eulabis pubescens* Lec., and *Blapstinus rufipes* Casey.

ANTS FROM CATALINA ISLAND, CAL.

By William Morton Wheeler.

Of the eight species of Formicidæ collected on Catalina Island, California, by Prof. C. F. Baker and wife, four present subspecific or varietal peculiarities, probably of geographical significance, though all the forms are represented on the adjacent mainland. Of especial interest are the new variety of **Monomorium minutum** with wingless, ergatoid queens, and the new subspecies of **Henamina patruelis**, a form originally described and hitherto known only from the Island of Guadalupe, off the coast of Lower California.

1. **Monomorium minutum** Mayr, var. **ergatogyna**, var. nov.

I base this variety on a number of workers and eight females from three different colonies. The workers differ from those of **M. minutum** var. **minimum** Buckley, common over a large portion of the United States, only in size, being only 1.5 mm. in length, whereas the workers of **minimum** are usually 2.—2.2 mm. long. All the female specimens are ergatoid, i. e., they show no traces of wing insertions, they are smaller (only 3.25—3.5 mm.) and have smaller eyes and more slender thoraces than the winged females of the typical form, which measure 4—5 mm. It would be interesting to know whether these wingless females, taken from three different nests, are the only type of female produced by this variety. If such is the case, they probably represent an adaptation to life on an oceanic island comparable to the well-known apterous conditions in the insects of Madeira, Kerguelen, etc. I have recently received from Mrs. Annie Trumbull Slosson several specimens of **Monomorium floricola** Jerd. collected at Biscayne Bay, Florida. Among these are three ergatoid females presenting the same peculiarities as the specimens of **M. minutum** above described.

2. **Solenopsis texana** Emery, subsp. **catalinæ**, subsp. nov.

Several workers and two dealated females differing from the typical Texan form in the more uniform coloration and the absence of any infuscation on the gastric segments of the female. In the latter sex the node of the petiole is decidedly more compressed antero-posteriorly, and the greatest width of this segment when seen from above is behind instead of at the middle, as in the female of the typical **texana**. The postpetiole is also shorter and its angles sharper than in the typical form. The pelosity of the worker is sparser and somewhat less conspicuous. The nodes of the pedicel are of very nearly equal breadth.

3. **Pheidole hyattii** Emery.

Soldiers and workers from four different colonies and all belonging to the typical yellow Californian form,

4. **Crematogaster lineolata** Lay, subsp. **coarctata** Emery.

Several workers indistinguishable from the typical Californian form.

5. **Stenamma (Aphænogaster) patruelis** Forel, subsp. **bakeri** subsp. nov.

Workers from two colonies. Whole ant shining, the sculpture on the head being confined to sharp and rather irregular longitudinal rugæ, with very indistinct interrugal sculpture. Upper surface of thorax glabrous, meso and metapleuræ with a few longitudinal, the basal surface of the epinotum with a few transverse rugæ. Pro- and mesothorax curvex, hemispherical, basal surface of epinotum evenly curvex in profile. Epinotal spines very small, acute, much farther apart than long. Body and appendages yellow or yellowish red, except the following portions: There is a large brown blotch on the vertex; the inner borders of the mandibles are black; the summits of the nodes of the pedicel, the gaster with the exception of the incisures, and in some specimens also the middle portions of the femora and tibiæ, more or less infuscated or black.

Forel and Emery regard **patruelis**, originally described from the Island of Guadalupe, as a subspecies of **S. subterraneum** Latr., but I am inclined to separate it as a distinct species on account of the peculiar shape of the thorax. In **subterraneum** and its western form, **occidentalis** Em., the pro- and mesonotum are less hemispherical and the basal surface of the epinotum is straight or even somewhat concave in profile. There are so many forms of **subterraneum** in the western states that it will be advantageous to regard **patruelis** as a distinct species, though it must still be placed in the **subterraneum** group.

S. bakeri is a very striking form on account of its glabrous surface, yellow color and the conspicuous blotch on the vertex.

6. **Stenamma (Messor) andrei** Mayr.

A single worker of this species, which seems to be rather abundant in California and Nevada.

CAMPONOTINÆ.

7. **Camponotus maculatus** Fabr., subsp. **vicinus** Mayr., var. **nitidi ventris** Emery.

One soldier and four workers.

8. **Camponotus hyattii** Emery, var. **bakeri**, var. nov.

Media. Length, 5.5 mm.

Differing from the typical form in coloration which is like that of **C. marginatus** Latr., subsp. **discolor** Emery, except that the basal two-thirds of the first gastric segment are also red like the head thorax and appendages. The sculpturing of the whole body is quite as sharp as in **marginatus** so that the sur-

face, even of the head, is quite as opaque as in that species. Mandibles and cheeks coarsely punctuate. Thorax in profile like that of the typical *hyattii*, except that the basal surface of the epinotum has a transverse depression behind when seen in profile.

More material of this form may show that it is to be regarded as a distinct species.

Female. Length, 7.5—8 mm.

Presenting the female of *C. marginatus*, var. *discolor* Buckley. Head longer than broad, with nearly straight posterior border and prominent posterior angles; cheeks converging in front and distinctly concave. Mandibles 5-toothed. Whole body more shining than in *discolor*, though it is throughout distinctly shagreened. The mandibles, cheeks and front are coarsely and evenly punctuate. Body and appendages yellowish red; teeth of mandibles, anterior edge of clypeus and cheeks, scutellum, mesonotum, a band across the posterior portion of the first and second gastric segments, and the remainder of the gaster, all black. All the gastric segments are edged with yellow. There is a more or less distinct brown cloud on the antero-median and, in one of the specimens, also on either lateral surface, of the mesonotum. Wings yellowish gray with brownish yellow veins.

Described from two mediæ and two female specimens.

NEW FUNGI FROM CATALINA ISLAND.

By J. B. Ellis and B. M. Everhart.

The following forms are recognized in the collection made by Professor and Mrs. C. F. Baker, at Catalina Island:

Briardia nigerrima E. & E. n. sp.

On *Rhus laurina*, Catalina Island, off the coast of Southern California, March, 1904 (C. F. Baker, No. 4038).

Apothecia gregarious, erumpent between the fibres of the bleached, weather-beaten wood, 1-4 mm. long, 1 mm. wide, black. Asci at first subglobose, then obovate-oblong, 40x12-15, 8-s spored. Sporidia irregularly crowded, oblong-clavate, hyaline, becoming brown, guttulate, 8-12x3-4 u, continuous. Paraphyses branched above, and bearing a black epithecium composed of subglobosa, brown (becoming black) conidia, indistinctly submuriform, seotate, 6-7 u in diameter.

Phænangium sphæroides E. & E. n. sp.

On bleached wood of *Rhamnus* and of *Rhus laurina*, at Avalon, Catalina Island, California (C. F. Baker, Nos. 4039 and 4045).

Gregarious; apothecia round, black, smooth, globose at first, becoming depressed obconical with the disc plane or concave

(convex when moist), $\frac{1}{2}$ - $\frac{3}{4}$ mm. in diameter, the margin incurved when dry. Asci cylindrical, p-sp. 50-55x4 u. Paraphyses obscure. Sporidia uniseriate, oblong-elliptical, almost opaque, 6-8x3-4 u, resembling the sporidia of a *Hypoxylon*.

The name *Phænangium* was first used by Saccardo as a sub-genus of *Cenangium*, embracing species with dark-colored spores. In Syll. XVI, p. 764, he gives *Phænangium* generic rank. *Phænangium* Patouillard is entirely different; see Syll. XI, p. 442.

Didymosphæria catalinæ E. & E., n. sp.

On dead stems of *Artemesia californica*, Avalon, Catalina Island, California, March, 1904. (C. F. Baker, No. 4041.)

Perithecia scattered on the bleached stems, raising the epidermis directly over them into little black pustules about $\frac{1}{2}$ mm. in diameter, mostly slightly compressed laterally; ostiola papilliform, minute, finally perforated. Asci cylindrical, short-stipitate, 90-100x12 u, with abundant paraphyses, slightly enlarged at the tips. Sporidia uniseriate, oblong, hyaline at first, becoming pale brown, uniseptate and constricted in the middle, 15-22x6-7 u.

Allied to *D. brunneola* Niessl., but that species has much smaller (7-12x4-6 u) sporidia.

ON SAN JACINTO TRAILS.

By Blanche Trask. "

(Read before Section of Botany, April 18, 1905.)

In the San Jacinto Mountains, last November, I was fortunate in finding *Eunonymus parishii* growing luxuriantly in Fern Canyon; also in a canyon—or more properly gorge—which opens into Strawberry Valley from the east, presumably the habitat in which it was first found and to which Mr. Hall refers in his Bot. Sen., Page 93. It is in full growth just below the fall of a little stream which trickles over an exposed ledge of granite, which is a landmark from the opposite side of Strawberry Valley heights and facing Lily Rock; it is the first gorge to the left.

The shrubs are from four to ten feet tall and there were no fresh flowers, while the leaves had mostly fallen. It could be distinguished at a distance by the long wand-like bunches of bare stems rising like a smoke from the bed of the stream, otherwise easily confounded with the Rhododendron which abounds and in many places fills these arroyos.

The fruit of *Eunonymus parishii* is exquisitely beautiful, with the persistent white waxy petals open like a bud about the gay scarlet anilate seeds; capsule 2-3 lobed and one or two seeds in each cell; the third lobe very often abortive.

The trend of the San Jacinto Range is from the peak towards the southeast for twenty-five miles to Santa Rosa Mountain, and presses closer and closer to the desert until it begins indeed to take on its atmosphere at Van de Venter Flat, at an elevation of 4500 feet; the remarkable *Pinus quadrifolia* lives in and on the banks of Coyote Canyon. It is there the predominating tree, and perhaps would present a more pleasing appearance had you not come directly from the great forests of Strawberry Valley; it certainly could not afford a more interesting sight. In its youth, it is as trim and indeed as symmetrical as a fir, although it later becomes scraggy and loose-limbed. It is said to be of very slow growth and will not endure trimming or the pruning knife. The leaves number generally from two to five and there are those where two predominate.

The largest trees are thirty feet high and the Van de Venters, who were born in this country, seem to recall no perceptible increase in number of these pines in twenty-five years. The older boy can remember when a *Pinus monophylla* beside the trail today, and about twelve feet high, was only two or three feet tall when he was a lad of seven years. *Pinus monophylla* is very common in all desert ranges from 3000 to 4000 feet elevation.

Both these pines bear profusely and the cones are identical to all appearances, but the nut of the *P. quadrifolia* is hard, while that of *P. monophylla* is soft. "The only family of the Santa Rosa Indians which now remains at the old Indian village, up in the Santa Rosa Mountains, say that these pines (*P. quadrifolia*) were **planted** in Coyote Canyon by their forefathers; **when**, they do not know. They still gather the nuts for food!

Facing northeast, Coyote Canyon is to the right of Van de Venter Flat about a good mile. From Van de Venter Flat, Buss Canyon breaks away to the Colorado Desert. This flat is really a pass between San Jacinto and Santa Rosa Mountains. Five hundred feet below this pass *Pinus monophylla* begins to grow and is more or less common in all the desert slopes. El Toro Mountain, which rises yet east of Santa Rosa Mountain, has a curious top—as though it had a hollow cone, and one day, from too great a desert blast, had crumbled and fallen in; this mass of old rock-dust seems marked with foot prints of the earthquake, yet strangely enough *P. monophylla* is thickly set there.

Deep Canyon, which is crossed on the Martinez trail, has a trickling streamlet and in its bed the ash (*Fraxinus*) grows to be a tree. *Populus* abounds and even elders fifty feet high show their beautiful trunks against the over-toppling crags; yet fifty feet away Yucca and the Spanish Bayonet grow hap-

pily. The trail to Palm Canyon opens out from Van de Venter Flat, and the wall which encloses "Big Canyon" all the way seems to have been thrown there by the hand of a Cyclops; perhaps Big Canyon is Palm Canyon. You might find out if you had the courage to drop into its head and follow it until you meet the first palm; follow it—at least—so long as you lived; what with the furnace blast of the desert and the cacti which beset the way, and the utter lack of water, and no shade save such as a prostrate Juniper bush can give. As you will have long since left the pines behind, you are quite content to tramp along without investigations either to right or to left, other than those which are thrown in your way.

The land is sentineled by yuccas and century plants ten to twenty feet tall, and white as tapers in November against the over-burnt hills, while Spanish bayonets are challenging on every hand; endless "washes" line the way where you walk, and you hail the "desert willow" or clump of dry cottonwoods as a remarkable propitiation of the fates; indeed, you come to think no green thing can thrive in such a land and that all must partake necessarily of the grayness of the sage brush or of the color of the sun, or of the volcanic tints of the over-burnt hills. But the next moment transfixed you stand, for just below in a tangled arroyo are the uplifted plumes of a forest which "stand dressed in living green;" while a thousand feet below and beyond the white sands of the deserts are drifted like the snows on San Jacinto's head in winter, and you tramp down as in a dream to drink of the water and to lave your burning head.

The palms, over one hundred feet high, thrive in these arroyos, where columnar cacti as large as a man's waist, live on the dry cliff edges.

Although it seems a desecration to use a palm as a back-log, the great trunks one to two feet in diameter make an excellent bed of coals in the campfire all night.

The stream of water in which the palms grow is strongly alkaline and is always running even in dry years. There is also a warm spring in this region.

Young palms are as thick as grass under your feet and in all stages of growth. There are so many trees and the fallen leaves occupy so large a space that it is really a difficult task to tramp through these places; you cannot decide whether to turn to left or right, as trees twenty-five to thirty feet tall are burdened with their down-hanging leaves, which droop to the ground and make of them mammoth screens. Whichever way you go, you are sure to encounter the hooked-spine, leaf-blade of the palm, and stepping high to lunge over

a pile of dry leaves, you will be precipitated into a hidden spring or a rock-pool. Necessarily your progress is slow, but the palms tower overhead, and from every crag their leaves are silhouetted against the sky, while you seem to hear the sound of that old sea which broke so long ago over the white sands at the foot of these very cliffs.

Avalon, Santa Catalina Island.

A PRELIMINARY SYNOPSIS OF THE SOUTHERN CALIFORNIA CYPERACEÆ. VIII.*

By S. B. Parish.

* *Perigynia* Stramineous or greenish, as are the scales, so that the spikes appear light in color; the long beak bidentate; stigmas 3; pistillate spikes erect, except No. 2; bracts not auriculate.

+ *Perigynia* thin and firm in texture, tapering into a beak one-third as long as the body; staminate spike solitary, except No. 1.

++ *Perigynia* glabrous, inflated and not filled by the achene.

1. *Carex utriculata* Boott; Hook. Fl. Bor. Am. 2:221:W. Boott in Wats. Bot. Cal. 2:252. Britt. & Br. Ill. Fl. 1:297. Bailey, Bot. Gaz. 9:122; Mem. Torr. Club, 1:59. *C. rostrata utriculata* Bailey, Proc. Am. Acad. 22:67.

Stoloniferous; culms stout, scabrid, 5-10 dm. tall; leaves flat, 5-8 mm. wide, nodulose, scabrid, exceeding the culms; bracts similar, the lowest exceeding the culm; staminate spikes 2-3; pistillate spikes 2-4, cylindrical, densely-flowered, $\frac{3}{8}$ cm. long, sessile, or the lowest pedunculate; scales equalling or exceeding the perigynia, lanceolate, prolonged to an acuminate scabrid tip; perigynia ovoid to ovoid-oblong, few-nerved, the body 2-3 mm. long, and the beak half as long, its teeth erect; achenes oblong.

Common in wet meadows, Bear Valley, 6,500 ft. alt., in the San Bernardino Mts.; 1275a Parish. Bluff Lake, 7,400 ft. alt.; Parish. This is the southern known limit of the species, whence it extends north through the Sierra Nevada to British Columbia; also in the Rocky Mts., and in northern Atlantic States.

2. *C. utriculata minor* Boott. l. c. Leaves narrower, and spikes slenderer and shorter.

Bear Valley, with the species; 1575 Parish.

*Continued from Page 52 (This Volume), No. 3, March, 1905.

✓ 2. **Carex comosa** Boott, Trans. Linn. Soc. 20:117. Britt. & Br. Ill. Fl. 1:301. **C. pseudocyperus comosa**, W. Boott in Wats. Bot. Cal. 2:252. Jepson, Fl. W. M. Cal. 90. **C. pseudocyperus Americana**, Hochst Herb. Unio. Itin. (1837). MacMill, Met. Minn. Val. 126. Bailey, Mem. Torr. Club, 5:89. Abrams, Fl. Los Ang. 73.

Cæspitose; culms stout, 5-10 dm. tall, very rough on the sharp angles; leaves 6-10 mm. wide, nodulose, the upper, and the similar bracts, exceeding the culms; staminate spike 2-8 cm. long; pistillate spikes 3-5, cylindrical, 5-7 cm. long, 8-10 mm. thick, approximate, drooping on short peduncles; scales shorter than the perigynia, ovate at base, attenuate to a rough awn; perigynia ovoid-ellipsoidal, prominently many-ribbed, stipitate, and at maturity reflexed, the body 3 mm. long, tapering into a long slender beak 1.5 mm. long, the divergent and recurved subulate teeth as long as the beak; achenes sharply triquetrous, 1.5 mm. long.

Perhaps only a waif. A single plant, growing in swamy soil, by a roadside, near San Bernardino, 1882; Parish. Reported by Davidson, in Pl. Los Ang. Co. 30, from Burbank, but there is no specimen in his herbarium. In the Atlantic States from Newfoundland to Louisiana; on the Pacific coast from Oregon to San Francisco.

++ *Perigynia hirsute, obovoid, completely filled by the achene.*

✓ 3. **Carex lanuginosa** Michx. Fl. Bor. Am. 2:175. Britt. & Br. Ill. Fl. 1:305. **C. filiformis lanuginosa** B. S. P. Prel. Cat. N. Y. 63. Bailey, Mem. Torr. Club, 5:78. **C. filiformis latifolia** Boeckl. Linnaea, 41:309. Bailey, Proc. Am. Acad. 22:74; Mem. Torr. Club, 1:64. W. Boott in Wats. Bot. Cal. 2:250. Abrams, Fl. Los Ang. 74.

Culms tufted, smooth, 5-10 dm. tall; leaves flat, rough on the edges, 3-5 cm. wide, equalling the culms; bracts similar, the lowest exceeding the culms, the upper narrow; staminate spike 3-4 cm. long, often with 1-2 short spikes at base; pistillate spikes 2-5, cylindrical, 1-3 cm. long, 7-8 mm. thick, sessile, or the lowest remote on a short peduncle; scales longer than the perigynia, glabrous, narrowed to a rough awn; perigynia fuscous, the body 3 mm. long, shortly stipitate at base, tapering into a beak 1 mm. long, the teeth glabrous, erect, 0.5 mm. long; achenes olivaceous, smooth.

Borders of swamps in the Cismontane region, below 3,000 ft. alt.; apparently rare. San Bernardino Valley, and Edgar Canyon, in the San Bernardino Mts.; Parish. A widely distributed species, from the British Possessions to the Mexican border.

A sedge collected in 1891, by Davidson, at Los Angeles, has pistillate spikes only 2-3 mm. thick; scales oblong, the midvein excurrent from the emarginate apex as a short cusp, shorter than the perigynia, which are broader, and shorter beaked. Probably distinct, but further material is needed.

4. **Carex Yosemiteana** Bailey, Mem. Torr. Club, 1. 8. **C. Sartwelliana**, W. Boott. in Wats. Bot. Cal. 2:249.

Cæspitose; culms rather slender, 3-angled, slightly scabrid above, 8-10 dm. tall; leaves hirsute, 5-6 mm. wide, shorter than the culms; bracts slender, the lowest exceeding the culm; staminate spike 5-6 cm. long; pistillate spikes 2-4, cylindrical, sessile, 2-3 cm. long, 5 mm. thick; scales brown with green midvein, hispid, acute, or the lower prolonged to a rough awn, as broad as the perigynia, and equalling or exceeding them; perigynia ovoid, acute at base, the body 2 mm. long, gradually narrowed into a beak 1 mm. long, the teeth short and erect; achenes pale brown, granulate-roughened.

On a dry slope, Strawberry Valley, 6,000 ft. alt., San Jacinto Mts.; Parish. San Jacinto Mts.; Davidson. Reported otherwise only from the high mountains of Mariposa Co.; where it was collected long ago by Bolander and Brewer, and in recent years by Congdon; but probably occurring at intermediate points.

(To be continued.)

BULLETIN

OF THE

Southern California Academy of Sciences

COMMITTEE ON PUBLICATION

THEO. B. COMSTOCK, S. D.; A. DAVIDSON, C. M., M. D.; WM. H. KNIGHT.

CONTENTS:

	Page		Page
The Duty of the Hour (Editorial).....	69	A Fossil Tooth.....	79
Transactions for April 1905.....	70	A Preliminary Synopsis of the South-	
Academy, Directors.....	70	ern California Cyperaceæ, IX,	
Sections: Biology.....	70	by S. B. Parish.....	80
Astronomy, Geology.....	71	Gems and Rare Minerals of Southern	
Botany.....	72	California, by L. Douglas Sovereign.....	85
Publications Received.....	72	Hear! (Editorial).....	90
The Metabolism of the Neurone, by		Scope and objects of the Academy.....	91
Dr. Louisa Burns.....	73		

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THE DUTY OF THE HOUR.

Not mere words, but work—hard, persistent work—on the part of every member of the Academy is demanded by the present condition of affairs. We are probably coming through the fiscal year about even with creditors, and there is much to the good in the way of accomplished result. Still, we lack coherence and enthusiasm, and some of us know how far short the Academy has come of performing its due share of what is within its easy reach.

At the same time, there has been decided advance this year in the quality of our contributions to science and in the interest shown in the work of the several sections. This only serves to emphasize the constantly growing need of permanent quarters and a depository for the increasing library and collections, which now are inaccessible to those most needing them for reference.

The Committee on Publication has offers of most important scientific monographs which must be declined unless funds can be somehow provided for the bare cost of printing. It would be a disgrace to the Academy to let these precious things pass to other hands, but just now there does not appear to be any means of publishing them under our own auspices.

TRANSACTIONS FOR APRIL 1905.**I. ACADEMY SESSION.**

Los Angeles, California, April 3, 1905.

The regular monthly meeting of the Academy was held this evening at 8 o'clock at the State Normal School.

A lecture was delivered by Mr. F. Hamer Maude, M. B. C. M., on "The Havasupai Indians and Their Canyon Home."

In the progress of the lecture, which was illustrated with numerous beautifully colored lantern views, the lecturer dealt with the archæology and ethnology of the Havasupai Indians, as well as with the topography and geology of the Cataract Canyon region which they inhabit. Based, as the lecture was, upon personal observations during repeated visits to this interesting region, Mr. Maude succeeded in enlisting the attention and appreciation of all present.

B. R. BAUMGARDT, Secretary.

II. BOARD OF DIRECTORS.

Los Angeles, April 8, 1905.

A meeting of the Board of Directors was held this afternoon at 3:30, at the office of Dr. T. B. Comstock, Stimson Building, Los Angeles. Present: Dozier, Comstock, Whiting, Taber and Baumgardt. President Dozier occupied the chair.

The first business in order was the nominations for the offices of President, Vice President and Secretary, and three Directors, for the forthcoming election in May. The result of the nominations was as follows:

Prof. Melville Dozier received the nomination for President.

Mr. J. D. Hooker received the nomination for Vice President.

Mr. B. R. Baumgardt received the nomination for Secretary.

Messrs. Whiting, Taber and Comstock received the nominations for Directors.

It was moved and carried that the President request the Chairman of the Agricultural Chemical section to report upon its activities.

Dr. F. M. Palmer was received into membership.

Dr. C. H. Phinney and Dr. Cress were appointed tellers to act at the forthcoming election in May.

Adjourned.

B. R. BAUMGARDT, Secretary.

III. MEETINGS OF SECTIONS.**1. Biology.**

April 10th, 1905.

The meeting of the Biological Section of the Southern California Academy of Sciences was called to order by the Chairman of the Section. The minutes of the last two meetings were read and approved.

The first business undertaken was the election of officers for the ensuing year.

As the result of the election Prof. A. B. Ulrey was elected Chairman and C. A. Whiting was elected Secretary.

The lecture of the evening was given by Dr. Louisa Burns on "Some Recent Literature Relating to the Nervous System." The lecture was illustrated by slides which were exhibited under microscopes.

About twenty-five members and visitors were present.

The May meeting will be addressed by Dr. Bebb on "The Comparative Anatomy of the Teeth and Skulls of Man and Other Mammals."

C. A. WHITING, Secretary.

2. Astronomy.

The April meeting of the Section was held on the 17th at the Normal School building. In the absence of the Chairman the Secretary presided, and introduced the topic of discussion. The subject before the Section was the consideration of the Calendar, its history and the principles of its construction.

In early times the month was a much more common unit of time measure than the year, and all matters relating to dates and seasons were in the hands of the priesthood, and much confusion resulted from the inaccuracy of their methods and the consequent necessity of intercalary days, introduced for the purpose of keeping the calendar correct. The Mohammedans still use a purely lunar calendar, having a year of twelve lunar months, containing alternately 354 and 355 days.

On this account the same season does not recur at the same time of the year in successive years, and the calendar gains about one year in thirty-three.

The Metonic cycle, named in honor of Meton, the Grecian discoverer, consists of 235 synodic months, or almost exactly 19 years. The "Golden Number" of a year is the place of the year in this cycle, and is found by adding 1 to the date number of the year, and dividing by 19.

At the time of Julius Cæsar the Roman calendar had become very inaccurate, and, by the aid of Sosigenes, an Alexandrian astronomer, he formulated and decreed the use of the Julian Calendar, changing the beginning of the year from March to January, lengthening it to 365¼ days, and naming what was formerly the fifth month in honor of himself, "July." Augustus Cæsar, not to be outdone by his illustrious uncle and predecessor, changed the name of the sixth month to August, and added one day to it at the expense of February.

The system of adding one day in four years to supply the time lost by dropping the one-fourth of a day each year, resulted in an error of about three days every four hundred years; and at the time of Pope Gregory the error had grown to ten days. This condition of things was remedied by the dropping of ten days from the calendar in October, 1582, and providing that, of the century years, only every fourth one should be counted a leap year.

This method will keep the calendar practically correct for several thousand years. The Gregorian year has been adopted by all Christian countries except Russia, whose calendar is now twelve days behind that of other countries. Russian dates are usually written double, as 7-19, to denote both the Julian and the Gregorian date.

The discussion led to the consideration of kindred topics, and the Section felt that a profitable hour had been spent.

MELVILLE DOZIER, Secretary.

3. Geology.

Los Angeles, Cal., April 24th, 1905.

The Geological Section met at the State Normal School Building at 8 p. m. The meeting was called to order by Chairman Geo. W. Parsons. Prof. L. Douglas Sovereign being indisposed was not present, but the chairman read his paper on "Gems and Curiosities of Southern California."

In the paper he stated that "hidden deep in the heart of the heat distorted Colorado Desert in San Diego County, guarded by the great naked buttes that frown down upon the intrepid prospector, is probably one of the richest of Nature's unrifled coffers of crystalline wealth, and few fields in the world offer the gem hunter greater possibilities."

"The finding of the richest and most productive known deposits of tourmaline crystals, the uncovering of the only known deposits of lilac-

colored spodumene, and the discovery and development of lepidolite in quantities never dreamed of before the uncovering of the Pala dike, are among its claims to distinction."

He also stated that these deposits have attracted scientists from many parts of the world. Near the deposits mentioned is the famous kunzite mine. He also mentioned that at Mesa Grande was found the largest deposit of tourmaline crystals of gem quality known.

The paper was quite lengthy and full of interest.

G. MAJOR TABER, Secretary.

4. Botany.

The Botanical Section met on April 18.

Mr. Ernest Branton read a paper on "The Flora of Amador County." He compared the flora of that district with the South.

Brodiaea grandiflora is almost a pest. *Chenopodiums* are common, *atriplex* is unknown. *Cynara cardunculus* and *Filago gallica* were among the varieties mentioned.

C. RUSSELL, Secretary.

PUBLICATIONS RECEIVED.

"*Muhlenbergia*." Vol. 1, No. 6. New Species in *Ribes*, *Trifolium* and *Stachys*.

"Injury to Vegetation by Smelter Fumes," by J. K. Haywood. U. S. Dept. Agricult. Chemistry Bulletin No. 89.

From investigations made at the Mountain Copper Works, Redding, Cal., the author has concluded that "sulphur dioxid when present in small quantities in the air kills vegetation. The vegetation around the smelter for at least 3½ miles north, 9 miles south, 2½ miles east, and 5 or 6 miles west, has been greatly injured." The author suggests condensing the sulphur fumes and manufacturing sulphuric acid. A. D.

"Fifteenth Annual Report." University of Arizona Agricult. Experiment Station.

"Pear Scab," by R. E. Smith. University of Cal. Agricult. Exper. Stat. Bulletin No. 163.

A full and well illustrated paper, giving account of the methods of infection and the methods of prevention by spraying. A. D.

"Twenty-second Report of the Agricultural Experiment Station" of the University of Cal., 1903 to 1904.

"Practical Suggestions for the Codling-Moth Control in the Pajaro Valley," by W. H. Volek. University of Cal. Circular No. 14.

"*Asparagus* and *Asparagus Rust* in California," by Ralph E. Smith. University of Cal. Bulletin No. 165.

"*Limii*," by William A. Setchell. University of Cal. Botany. Vol. 2, No. 3.

Treats chiefly of the edible seaweeds of Hawaii.

"Postembryonal Stages of the *Laminariaceæ*," by W. A. Setchell. University of Cal. Botany. Vol. 2, No. 4.

Parergones del Instituto Geologico de Mexico. Tomo 1, Num. 8. Hidrologia subterranea de los Alrededores de Queretaro. Por el Ingeniero de minas Juan D. Villarelo. 3 Plates, 2 Figs.

THE METABOLISM OF THE NEURONE; A RESUME.

By Louisa Burns, B. S., D. O.

(Read before Section of Biology, April 10, 1905.)

In all physiology there is no problem of more fascinating intricacy than this. The very difficulties which hedge about its solution are no small factors in the attraction it has exerted over the minds of investigators. Up to the present time, however, all the light which research has thrown upon the problem has served chiefly to reveal new complexities. At the present condition of our knowledge of biology we should scarcely anticipate any other result. It is the purpose of this paper to bring together some of the results of recent researches in this line of investigation.

The metabolism of the simplest cell is not yet unveiled. We are just beginning to realize certain laws of cause and effect, and of the conservation of energy in life processes, and, while so far we are unable to express vital phenomena in the terms of physics or of chemistry, yet we are persuaded that only the imperfection of our own powers of observation and correlation prevent such expressions. This ability to describe in detail the life events of the humbler cells, were it granted, would be of inestimable value in the elucidation of the metabolism of the extremely complex and highly differentiated cells called neurones.

Since electricity, light, sound, heat and the grosser vibrations are able to bring about the decomposition of comparatively simple inorganic molecules, it is, perhaps, quite easily conceivable that the far more unstable molecules of the olfactory cells should be re-arranged by the attenuated emanations from the fraction of the millionth part of a grain of musk; that the tone of a bell miles away should initiate a nerve impulse in the auditory neurones of the same key and none other; that rays of light which have been traveling through space since the pyramids were young should cause the disintegration of the tigroid masses in the retinae of our own eyes. These things are not altogether inexplicable in the face of our knowledge of the inorganic world.

If ever we become able to picture the molecule of living protoplasm, the concept will be that of a molecule made up of nascent radicals, combining and dissociating with dizzying rapidity and with the evolution of kaleidoscopic varieties of compounds. If we imagine the simplest metabolism as such as this, the phenomena of memory indicate that we must conceive of the substance of nerve cells as undergoing such continuous changes, yet never becoming distorted, for years re-

taining visions of things seen, echoes of sounds, the sadness of grief, the fury of anger, the quiet power of loving kindness, and forcing these at intervals upon the present consciousness. Such a concept might be compared to some ever-changing, ever-constant Niagara—perhaps the drops which make up that cataract are not more numerous or of more changing relationships than are the atoms which enter into the metabolism of the neurone.

As in all living cells, the metabolism of the neurone is controlled by its nucleus. The functional integrity of the neurone depends upon its structural integrity. This quality, also, it shares with all other cells, as well as with organs of the body and with systems of organs. The nature of the nuclear influence upon the nutrition of the cell is yet the subject of much discussion. The nucleus is not large, probably not more than twenty-five microns (one-thousandth of an inch). The length of the axon is, in many instances, more than a meter. The nucleus, then, controls the nutrition of thirty million times its own mass of protoplasm.

Rolleston has shown that nerves undergo a rise of temperature at death. A number of observers find the normal alkalinity of both gray and white matter to be decreased after long stimulation. Halliburton and Brodie found the reaction acid shortly after death, but they were unable to render the splenic nerve of the dog acid to litmus during life, even by six hours faradisation. Hill, by applying Ehrlich's intra vitam methylene blue method to nerve tissues, has shown that these changes represent processes of oxidation, as was to be expected. These statements are verified by the classic experiments of Dr. Waller, who has demonstrated a discharge of carbon dioxide upon the passage of impulses over the axon. It is evident, then, that the axon in itself has a certain metabolic activity, which is, however, never independent of the nucleus. The investigations of Donaldson and Hoke, in the Laboratory of Neurology of the Chicago University, show that the mass of the axon is approximately equal to the mass of the medullary sheath. This is found to be true in more than fifteen hundred measurements of nerve trunks of animals of more than twenty genera, representing fish, amphibia, reptiles, birds and mammals, including man. The phenomena of degeneration and regeneration also indicate that the function of the medullary sheath is metabolic.

Neurones, in common with other somatic cells, are fed by lymph secreted from the blood by the endothelial cells of the capillary walls. Every nerve cell of the brain, probably of the whole nervous system, lies in a pericellular lymph space.

The lymphatics are represented in the brain by perivascular lymph channels. In this connection attention may be called to the peculiar neuroglia cells called "pod asteroids." These, which resemble the ordinary short-rayed glia cells in form, have from one to three short, fleshy, hollow processes which rest by a heavy expansion or "foot" upon the walls of the perivascular lymph channels. After traumatism or disease of the cerebral cortex, these cells are found to be swollen and filled with debris; the channeled processes also contain disintegrated nerve matter. The podasteroids seem, therefore, to act as excretory organs, though this function has not yet been satisfactorily demonstrated.

It does not appear that blood leaving the brain differs from venous blood found elsewhere in the body. The cell body with its stroma, fibrils and hyaloplasm, the bodies of Nissl, the various structures of axon and hillock, of nucleus and nucleolus, of karyoplasm and membrane, all are built from the water and oxygen, the various salts, albumins, globulins, and other compounds found in normal blood. The products of neurone katabolism include carbon dioxide, urea, some of the xanthins, cholesterin, lecithin and other compounds characteristic of katabolism everywhere.

In addition to the foods needed by all cells, the neurone requires for its normal metabolism the products of the ductless glands—the thyroid, the pituitary body, the supra-renals, etc. Perhaps we may think of these, with Sajous, as oxidizing ferments. According to Barker, these internal secretions are nutritional in their influences upon the neurone, that is, they may elaborate certain compounds essential to normal nerve nutrition, they may render inert some poisonous excreta of the neurone, or they may supply substances to the blood which perform this function. The symptoms of myxoedema, cretinism and acromegaly illustrate the grave effects of abnormal conditions of these glands upon neurone metabolism.

Normal metabolism requires a certain amount of activity. For this, the neurone is dependent upon external stimulation. The retinal cells, for example, are dependent upon light, the olfactory upon odor, and so forth. The sensory neurones of higher orders depend for their stimulation upon impulses arising from the peripheral sensory neurones. The association areas receive from the sensory neurones the impulses which, after re-arrangement, are sent out over the motor pathways. Ultimately, therefore, the activity and development of the whole nervous system is dependent upon the number and character of the impulses sent in over the sensory neurones.

Perhaps the most interesting of the structures of the neurone are the bodies of Nissl. Barker refers to them as the "larders" of the neurone; Held calls them the "rolling stock". These have not been demonstrated in the living cell, but after certain methods of fixation and staining have been employed, blue masses are found which represent conditions of life. Nissl uses the expression "cell equivalent" in this connection. A bank note is not money, it does represent money. Nissl's bodies can not be demonstrated in the living cell, but they do correspond to morphological conditions of the living cell with remarkable constancy.

The origin of these bodies is not known. Holmgren describes an elaborate process by which the nuclear wall breaks down, and the nuclear substance, passing into the cytoplasm, becomes the Nissl bodies. Von Durme believes that the Nissl bodies are derived from the nuclei of the lymphocytes. Scott advocates the view that the nuclear substance diffuses through the cytoplasm and is gathered into masses as the result of the growth and structural changes of the neurone. This distribution, he points out, leads to a more active and rapid metabolism than could be produced if the nuclear substance were retained in the orthodox position. It is agreed by all observers that katabolic changes in the neurone are accompanied by the disintegration of the Nissl bodies, whether these changes be produced by normal activity or by pathological conditions, such as traumatism, poisoning or starvation. This disintegration is called *choromatolysis*.

The products of abnormal or experimental katabolism give almost our only clue to the nature of the katabolic processes which may in any sense be regarded as essentially peculiar to the neurone. Lecithin is a phosphorized fat, found in all cells, but especially abundant in the nervous system. Cholin is split from lecithin by hydration, *in vitro*, by boiling with barium hydrate. The brain cells elaborate an enzyme capable of producing cholin from lecithin, as is shown by the exhaustive work of Isador Coriat in the laboratory of the Worcester Insane Hospital. According to Halliburton, cholin is found in abundance in the cerebro-spinal fluid of those dead of brain lesions, and also in the blood of those suffering from structural nerve disease. The blood of neurasthenics and others whose nerve disease is functional only, and of others in whom degenerative changes have ceased to be active, do not give this reaction. In normal cerebro-spinal fluid, cholin is found only in small quantities. The formation of cholin from lecithin is essentially characteristic of neurone katabolism.

Another substance characteristic of neurone katabolism is a yellowish pigment which apparently is normally retained within the neurone. According to Obersteiner and others this pigment is first found in the neurones of the spinal ganglia at about the sixth year. About two years later the cells of the cord contain this pigment. Throughout life it increases in quantity and in distribution. Rosin has made an especial study of this pigment. The bodies of Nissl are absent from the part of the cell occupied by the pigment. It is not identical with the pigments found in the locus ciruleus, the substantia nigra, etc. It stains with osmic acid but fails to give other reactions characteristic of fats. In old age many nerve cells are practically filled with this substance. In such cells the nucleus is found to be distorted and displaced or even dissolved or extruded. Eventually the cell membrane and protoplasm also disappear, leaving only the metaplastic granules of pigment in the midst of some detritus.

It must not be forgotten that the normal neurone is always in a state of activity. There is no such thing as absolute rest. Neither in the neurone, nor in other cells, nor in any living being, is rest or quiet found. There are only alternate periods during which now anabolism and now katabolism is most predominant. What we call rest is simply a period of cell-parsimony; what we call activity, a period of cell extravagance.

The great increment of katabolic processes which results from changes in the environment of the neurone is a nerve impulse. That is, a nerve impulse is simply the kinetic energy produced by the liberation of the potential energy stored in the cell in the form of the extreme complexity and instability of its molecules, especially of the molecules of the Nissl bodies. Any sufficient change in the environment of the neurone initiates the dissociation of these molecules with a corresponding evolution of energy.

Goldscheider has used the term "neurone threshold" to express the degree of excitation which is just sufficient to initiate a nerve impulse. Neurones vary in their threshold value with their location, structure and function. The threshold of the same neurone varies with its nutrition, development and conditions of stimulation. Attention is a semi-volitional or unconscious lowering of the threshold of certain neurone systems. By listening attentively, for example, sounds are apparent which would otherwise be unheard. The threshold value of association areas may be lowered to impulses which are especially welcome, hence the significance of the saying: "The wish is father to the thought." Every discharge of nervous impulse renders the cell more susceptible to subsequent excita-

tion. Education lowers the threshold of the sensory neurones and of the association areas. The formation of habits, also, depends upon this law—as the result of its influence, such complex actions as walking, writing, speaking, etc., are performed altogether by the lower centers and apparently without the least intervention of consciousness.

Variations of individual temperament depend largely upon variations of the neurone threshold in different neurone systems in different individuals. If the threshold value of the motor neurones is low, we find a careless or impulsive person, if the neurones of the emotional centers be the more unstable, an excitable person. If the neurones have a low threshold to nerve impulses and a high threshold to external changes, the owner is highly imaginative, he sees visions and dreams dreams. If the opposite relationship is found, he is observant and matter-of fact. The value of the neurone threshold is one of the important factors in the production of individual peculiarities. Other factors, such as the development of association paths, education, hereditary and environment are closely associated with this and with other phases of neurone metabolism.

Abnormally, the neurone threshold may vary within very wide limits. In melancholia the threshold may be tremendously increased. In delusional insanity the threshold value of certain neurone systems is lowered. In these cases the reaction time is greatly increased.

In neurasthenia the threshold value is increased, in hysteria it is decreased. In neurasthenia the increase of the threshold value is probably due to a decrease in the cell's power of recuperation, a nutritional disease. In hysteria the molecules of certain neurone systems are unstable to an abnormal degree. This too, is an instance of faulty metabolism. Rarely is the neurone at fault in such cases. Usually the neurones are starved, poisoned or overworked.

All our relations with the external world depend upon variations in the metabolic processes of the neurone. Our perceptions are true, our decisions wise and our deeds rational just to the degree in which the neurone metabolism is normal. A deficiency or an excess of any of the internal secretions; a lack of food, whether due to imperfect diet or to imperfect digestion and assimilation; intoxications, whether due to the ingestion of poisons or to the retention of excretory compounds; lack of oxygen, poor circulation, the lack of normal stimuli or the reception of excessive stimulation; all these tend to render our perceptions faulty, our judgments imperfect and our actions unjust.

In the light of these statements, upheld, as they are, by experimental and clinical evidence, perhaps it is not claiming too much to assert the existence of a physiological basis for a plea for modesty regarding one's own opinions and for hesitancy in the severe arraignment of other people's short-comings.

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A FOSSIL TOOTH.

Mr. W. S. Brady, of Hays Center, Nebraska, has deposited with the Editor of the Bulletin an excellent specimen of fossil tooth of an herbivorous mammal, said to have been exhumed in Fairfield Township, Bureau County, Illinois, in 1868 or 1869. This is presented to the Academy to be held in trust by the Editor until a museum be provided for its reception.

And that museum must be forthcoming shortly or we must admit that Los Angeles is behind all other cities in appreciation of pure science.

A PRELIMINARY SYNOPSIS OF THE SOUTHERN CALIFORNIA CYPERACEÆ. IX.*

By S. B. Parish.

++ *Perigynium chartaceous inflated, contracted to a beak less than one third as long as the body; staminate spikes 2-6.*

5. **Carex spissa**, Bailey, Proc. Am. Acad. 22:70.

Culms stout, 10-15 dm. tall, sharply angled, smooth; leaves carinate, 1-2 cm. wide, scabrid on the margins and on the prominent ribs, about equalling the culms; lowest bract leafy, very long, the uppermost short and aristate from a scarious margined base; staminate spikes slender, 5-10 cm. long; pistillate spikes, 3-6, densely flowered, evenly cylindrical, subsquarrose, the lowest 10-15 cm. long, remote, sometimes on a peduncle up to 25 cm. long, the uppermost sessile, or nearly so, 3-6 cm. long; scales exceeding the perigynia, narrow, purple margined, prolonged in a slender toothed tip, perigynia minutely purple-dotted, obovoid, attenuate to the base, subcompressed, plano-convex in section, the body 3 mm. long, the teeth less than 1 mm.; achenes brown minutely papillose, oblong-obovoid, 3-angled, stipitate and mucronulate, not filling the perigynia.

Growing in robust clumps on the banks of streams in the Coastal subregion below 500 ft. alt. Glendale; Hasse. Los Angeles; Davidson. Pasadena; Grant. San Juan Capistrano; Nevin. San Luis Rey; Poway; Parish. Ramona; Lakeside; Brandegee. Adjacent Lower California. Santa Maria; Brandegee. Guadalupe Canyon; Orcutt. The type was collected at San Diego, by Pringle.

Perigynia brunneus, fuscous or purplish, glabrous; scales purple, or very dark brown, with a narrow white or green mid-vein, so that the spikes appear more or less dark in color.

Perigynia thin and firm in texture, 3-angled tapering to a long point; bracts conspicuously sheathing at base.

6. **Carex ablata**, Bailey, Bot. Gaz. 13:82. **C. frigida** of American authors, not Allioni, Fl. Ped. 2:270.

Cæspitose; culms slender, scarcely angled, striate, smooth, about 1 dm. tall; basal leaves 2-3 mm. wide, long pointed, 5-10

*Continued from Page 68 (this volume), No. 4, April, 1905.



PLATE XI

Carex spissa.

(a) Perigynium $\times 6$

(b) Scale $\gamma 6$

cm. long; culm leaves 1-2, narrow, sheathing at base, 2-3 cm. long; lower bracts similar, uppermost scarious; staminate spike slender, 8-10 mm. long, usually with a small pedunculate basal spike, both of them pistillate at base; pistillate spikes 1-3, on included peduncles, the lowest distant, ovoid-oblong, 5-10 mm. long; scales ovate, ciliate above and mucronulate, 2 mm. long; perigynia divergent, very dark brown, obovoid to obovoid-ellipsoidal, acute on the edges, 3 mm. long; stigmas 3; achenes ash-colored, obovoid, 3-angled, muriculate, shortly stipitate and prominently beaked, filling the perigynium.

Grayback Mt., on High Creek, 9,500 ft. alt., July 24, 1904; 6405 Geo. B. Grant. The species is northern, and has been collected on Mt. Hood, Oregon, Stein's Pass, Wash., and in this state on the head waters of the Sacramento river. The present station is the southern limit.

Perigynia abruptly contracted to a short beak, and only partly filled by the achene, bracts with a more or less conspicuous and purlish, scarious, auriculate base.

Perigynia membranous, centrally tumid with the 3-angled achene, so that the edges appear as wings; spikes oblong, ovoid or clavate.

7. *Carex quadrifida cæca*, Bailey, Bot. Gaz. 21:8.

Culms slender, smooth, 3-5 dm. tall; leaves flat, 2-3 mm. wide, shorter than the culms; bracts aristate, seldom equalling the inflorescence; spikes 3-6, contiguous and sessile, or the lowest remote and pedunculate 1-2 cm. long, the uppermost usually androgenous, the others pistillate throughout; scales mostly shorter than the perigynia, lanceolate, acute or obtuse; perigynia purplish, obovoid, obscurely nerved, 2.5-3 mm. long, the bidentate beak purple; stigmas 3; achenes olivaceous, ovoid, muriculate, narrowed at base, 1.5 mm. long.

San Jacinto Mts. Tahquitz Valley, 8,000 ft. alt., July, 1892, (type), and Round Valley, 9,500 ft. alt., June 1903; Dr. H. E. Hasse. Also in the same mountains by Davidson. Grayback Mt. on Vivian Creek, 7,500 ft. alt., 1904, Geo. B. Grant. In other varieties the species is common at high altitudes in the central Sierra Nevada.

+ + *Perigynia chartaceous, scale-like, granular-roughened on the margins above; stigmas 2; spikes cylindrical, erect, densely imbricate, the lowest often attenuate at base; lower bract usually*



PLATE XII

C. Quadrifida caeca.

(a) Perigynium x8

(b) Scale x10

grass-like, those above aristate and sharply scabrid, the uppermost scarious and inconspicuous; basals sheaths nodulose, and the margins mostly fibrillose-reticulate.

= *Orifice of the beak bidentate.*

8. **Carex laciniata**, Boott, Ill. 4:175, t.594. W. Boott in Wats. Bot. Cal. 2:243. Bailey, Proc. Am. Acad. 22:83.

Stoloniferous; culms stout, acutely angled, scabrid, 3-10 dm. tall; leaves glaucous, stiff, carinate, equalling the culms; lowest bract equalling or exceeding the inflorescence; staminate spike 3-5 cm. long, usually with 1-2 short, sessile spikes at or near the base; pistillate spikes 3-4, sessile, or the lowest on a long peduncle, 3-10 cm. long; scales hardly equalling the perigynia, brown, narrow, the apex acute or prolonged, acicular-toothed; perigynia ferrugineous, orbicular to obovoid, nerved on the outer face, the beak, and usually the upper margin, acicular-toothed, contracted at base, 3 mm. long; achenes palid, orbicular, obtuse, papillose.

Canyons of the foothills, in the Cismontane region, below 2,000 ft. alt., San Antonio River; 529 Brewer. Glendale; Hasse. Pasadena; 799 Brauntun. Waterman Canyon, near San Bernardino; 2185 Parish. North to Southern Oregon.

The basal sheaths are described as fibrillose-margined, but the character does not appear in any of the numerous specimens examined.

Plate XX, Fig. 1.

✓ 9. **Carex Nebraskensis prævia**, Bailey, Mem. Torr. Club, 1:49. **C. Jamesii**, Torr. Monog. Cyp. 398. W. Boott in Wats. Bot. Cal. 2:243, in part.

Stoloniferous; culms erect, rough on the acute edges, 3-5 dm. tall; leaves flat, 4-5 mm. wide, shorter than the culms; staminate spikes 1-3, contiguous, the lower sessile; pistillate spikes 2-3, on short peduncles, 2-3 cm. long, 5 mm. thick; scales shorter than the perigynia, lanceolate, acute or mucronulate; perigynia ovoid or obovoid, nerved; achenes ovoid.

Bear Valley, 7,000 ft. alt., in the San Bernardino Mts.; 1578, 3280 Parish. Other immature specimens from the higher mountains, probably belong here.

(To be continued.)

GEMS AND RARE MINERALS OF SOUTHERN CALIFORNIA.

By L. Douglas Sovereign.

(Read before Section of Geology, April 24, 1905.)

Hidden deep in the heart of the heat distorted Colorado Desert, in San Diego County, guarded by great naked buttes that frown down upon the intrepid prospector, is probably one of the richest of Nature's unrifled coffers of crystalline wealth.

This little southwestern corner of the country, embracing the desert waste and the low mountain range between it and the sea, might well be named the jewel casket of the United States.

Though as yet only the hardest of prospectors have ventured from the beaten trails that mark the shortest route from water-hole to water-hole, those who have dared have either left their bones to whiten on the arid plain or been rewarded by evidence of vast undeveloped wealth.

Where the prospector's pick has uncovered those closely guarded secrets in this remarkable section, finds of commercial importance and of great scientific interest have been recorded.

There is probably no known section in the world that today offers the gem hunter greater possibilities, and there are few fields offering the geologist greater reward for research.

The astonishing discovery of rare minerals and unsurpassed crystals in the dwarf mountains to the west have comparatively recently brought this section into prominence. The finding of the richest and most productive known deposit of tourmaline crystals, the uncovering of the only known deposit of lilac-colored spodumene and the discovery and development of lepidolite in quantities never dreamed of before the uncovering of the Pala dike, are among its claims to distinction.

In importance the discovery of the lepidolite deposit, where development has brought to light immense quantities of ores of lithia, estimated by the thousands of tons, probably ranks first. The locality, without doubt, is unequaled in the world for its abundance of lithia minerals, as the deposit contains, besides high grade lepidolite ore, immense quantities of amblygonite.

The Pala mines would be interesting from almost any point of view. To the scientist the geology of the great dike of lithium bearing muscovite, tracked for hundreds of feet by well defined croppings, affords a study worthy of his best efforts. Commercially this deposit is of importance. Its prin-

cial value lies in the lithia the ore contains, carrying as it does on an average, close to 5%. Salts and tablets have been manufactured from the lithia extracted from this ore, and were the deposit reduced and converted into tablets there would be sufficient to meet the world's demand for generations to come or to convert one of our country's fresh water lakes into a great effervescent sea of trouble.

This ore contains close to 50% silica, 25% alumina, $12\frac{1}{2}\%$ potash and soda and small quantities of iron, manganese, fluorine, lime and magnesia. Aside from its importance as a lithia producer, its other properties give it almost as much value. In its reduction the lithia and potash can be extracted cheaply, and these are of course always marketable, but in this case the residuum would be of little value. If however the potash remains and only the lithia be removed, the remaining material will make a most beautiful opal glass; or by mixing it with good quality of kaolin, porcelain, or china, of great beauty can be manufactured at small cost. By taking the balance, after extracting the lithia and potash, and combining it with the necessary proportions of lime or limestone, and calcining and grinding, a good quality of Portland cement is the result.

So far as known, I believe, these are the only applications made up to this time, although it is more than likely that others will suggest themselves when the reduction of the ore is begun on a large scale.

The amblygonite, a lithium-aluminum phosphate, found associated with the lepidolite, is even more valuable from a commercial standpoint. Besides carrying a higher percentage of lithia than the lepidolite ore, averaging over 8%, it contains 46% phosphorus, over 33% alumina, with silica, lime, potash and manganese in small quantities.

After extracting the lithia from the amblygonite there remains a large amount of available phosphorus and alumina, the former at least of considerable value. It is used in various ways in the arts and sciences and is in demand in any amount obtainable as a fertilizing agent. The alumina can be produced as a sulphate to be used by dryers, paper makers or converted into alum.

It has been estimated that the byproducts after the lithia is extracted are of sufficient value to pay all the expense of the reduction of the ore, leaving the lithia as a profit.

To the layman, unacquainted with its commercial value and scientific importance, the deposit could not fail to be of interest as it is impressively beautiful. The colors of the ore range from rose pink through a variety of shades of violet gray to yellowish and whitish. It occurs in granular masses made up of foliated scales. Probably the most striking and beautiful ore is that

in which rubellite crystals are found entirely embedded in the lepidolite, the rubellite appearing as pink radiations in dark gangue of lilac-colored lepidolite.

Those who have been permitted to inspect the workings have marveled at the wonder-hand of Nature. From the rocky slope one plunges into the yawning mouth of a tunnel that zig zags its way to the ledge that lies between walls of pegmatyte, or muscovite-granite and quartz. In places, this quartz is deeply stained by bismuth and decomposed rubellite.

The first stope, broken in along the contact of the ledge and pegmatyte, is like a grotto in Aladdin's cave. Embedded in the walls on one side the rubellite is found in great radiations, like clusters of pink chrysanthemums on a background of lilac that shades to deep blue. On the other side the milky white pegmatyte, with large brilliant scales of mica, gives an attractive setting for the jet black crystals of tourmaline that are also found in radiations in this rock. The light of a single candle is caught up by the millions of scales and reflected over and over until the effect is dazzling.

This stope has been named by the workmen the "Bridal Chamber".

This deposit has attracted to it scientists from many corners of the world, German chemists being especially interested by reason of its lithia contents, as at present the principal supply of tablets is manufactured in that country.

Less than half a mile northeast of this deposit, across the canyon and near the summit of the western slope, is the famous Kunzite mine. Here less than three years ago was unearthed a most remarkable deposit of unaltered lilac-colored spodumene. These crystals were beautiful in their color tones, varying from deep rosy lilac to pale or almost colorless—a striking contrast to the rich deep pink-purple found at a greater depth.

This is the only known lilac-colored spodumene deposit in the world, and is most valuable for its beauty as a gem. Crystals to the value of many thousands of dollars have been taken from the ledge, and within the past thirty days several new pockets containing many valuable crystals have been opened. Hiddenite, or lithia emerald, is a variety of spodumene varying in color from a yellow green to a deep emerald green tinged with yellow. Like Kunzite this is at present known to but one locality (Stony Point in North Carolina), but knowing ones predict that development will also expose this valuable gem crystal at the Pala mines.

Kunzite is found in metamorphic rocks, generally gneiss or mica schist. The rock is a coarse decomposed granite, the feldspar much kaolinized and reduced to red dirt. The crystals

occur in a vein with rutile, tourmaline, black oxide of manganese and lepidolite. There are also quantities of quartz crystals. I have seen quartz crystals extracted from the ledge that weighed hundreds of pounds, many having perfectly formed terminations.

Dr. G. F. Kunz, for whom the remarkable crystal was named, says of it: "These crystals are extraordinary objects to the eye of the mineralogist; to see flat spodumene of characteristic form as large as a man's hand, but with bright luster and perfect transparency and rich delicate pink amethystine tint, is a novel and unlooked for experience."

One of the peculiar properties of the crystal is brought out in a paper by Charles Baskerville, who, in writing of the new find, said: "No such crystals of spodumene have ever been seen before and the discovery is of great mineralogical interest. The crystals have been etched by weathering and have a twinning like the hiddenite variety. The mineral, when cut and mounted parallel to the base, gives gems of great beauty. I have submitted large crystals to the action of ultra-violet light with very positive and continued phosphorescence. When subjected to the bombardment of the Röntgen rays of high penetration for several minutes no fluorescence is observed, but on removal to a dark chamber it exhibits a persistent white luminosity not observed with this class of minerals. I have been able to excite a crystal by the action of the X-ray for five minutes sufficiently to cause it to photograph itself when subsequently placed directly upon a sensitive plate and allowed to remain in a dark room for a period of ten minutes."

The mining of this gem crystal is done in the most crude fashion from open cuts following the outcrop, the crystals occurring in pockets.

In this same deposit gem tourmaline crystals are also found, but for the most part these are small. Above the lepidolite, however, and near the same ledge, some work has been done resulting in the exposure of clear tourmaline of very unusual blue colors. These are very rare and are not of large size.

At Mesa Grande, forty miles east and north of the Pala mines, is probably the largest ledge deposit of tourmaline crystals of gem quality known. While prospecting in the mountains in this locality a large ledge was discovered that appeared to be a mass of **lepidolite**. The first blast showed the **lepidolite** to be present in large quantities, but in larger and more brilliant scales than that at Pala. Subsequent development showed that both in the lepidolite and associated quartz were magnificent crystals of tourmaline, the **rubellite** variety predominating. These deposits are now worked through a tunnel and, since

the discovery, crystals to the value of thousands of dollars have been mined and cut into gems. Many of these crystals are translucent, or even transparent, and occur as large, separate crystals with perfect prisms and terminations.

The habit of the crystals is very interesting, in that many of them, when doubly terminated, end in a flat, basal form of pyramid, and are not hemimorphic, as tourmalines generally are. The question of color is also of interest. Some specimens are of one color only; others are green, then yellow, red and finally green; others are crimson, tipped with black, or dark green passing into blue. In some specimens the different colors pass imperceptibly one into another; in others the line of demarkation is well defined. I had some cut crystals mined at Mesa Grande at the St. Louis fair, showing the two colors in the cut stone. These were declared the finest gems of the kind on exhibition.

The mining of these stones at Mesa Grande is done principally by Indians who take great pleasure in seeking out the valuable crystals. There is a fascination about the seeking of value in the piles of worthless clay and quartz crystals, that appeals to the red man, and he is willing to work at low wages for the excitement of the thing and incidentally for what he can carry away. It might be said that it is not all that glitters that finds its way into the company's strong boxes.

The gangue of the Mesa Grande tourmaline is generally white opaque quartzite, the crystals penetrating in all directions. As depth is attained the colors become deeper and consequently more valuable.

In mining the ledge material is removed with as much care as possible, and after being broken, is sorted and screened. This is done with great care, as it is a very easy matter to fracture a crystal that might be worth many times its weight in gold.

There are many points in this section of the country where croppings can be seen that give as favorable indications of tourmaline as those at the Mesa Grande mine. Several small pockets have been uncovered on Smith Mountain, and even as far as Julian, pockets of lepidolite have been encountered.

Near Ramona golden beryls were recently found which, after cutting, are matchless for their brilliancy. In the same district rose beryls, perfectly formed, were found near the surface. Some of these shipped to New York brought handsome prices. A few really high grade aquamarines, showing clear shades of sky blue and sea green, have been found, and there are many evidences to encourage the prospector.

Garnets can be picked up in a dozen places, many found being clear and suitable for gem cutting. Spinel is known to

exist in at least one locality, and this fact alone would be an inducement to seek for other treasures.

Epidote, jade, turquoise, **aragonite** and zircons of the hyacinth variety, have also been found, though the country as yet has not been scratched over.

Among the really unusual deposits found in this section is a ledge of palagonite near the San Isabel valley. Though not a true mineral, being an alteration of tufa, resulting through the agency of steam or hot water, its presence is notable, as rare in this region. It is named from the place it was first found in Italy.

This deposit consists of a series of different colored ledges, each of which is well defined. They are continuous, the only line of separation being a marked change in their color. These ledges vary in width from five to twenty feet, forming a solid mass of material eighty feet wide. The natural colors of the higher grade varieties are umber, Indian red and sienna. This material when extracted is soft and can be cut with a knife, but when exposed to air it hardens and will take an excellent polish. Besides being available as a decorative stone, it can be used in the manufacturing of paints, paint filler, soap filler, sapolio, tooth powder, kalsomine, putty and polishing powder.

Still another unusual and interesting deposit is found in the mountain range chiefly near the desert's edge. It is a deposit of gabbro, granitoid, consisting chiefly of **labradorite** and **pyroxene**, containing **hornblende** and **magnetite**. Specimens of this orbicular gabbro have been polished and are truly beautiful. Were it possible to mine this in large quantities there would be a demand for it for decorative and ornamental work.

In view of the fact that only the most meager investigations have been made of the mineral resources of this section, it is truly remarkable that so many rare and valuable minerals have been found. There are most promising indications to induce the mineralogist to seek for the hidden things and within a short time others may be brought to light.

HEAR!

Dr. Jacques Loeb, of the University of California, protests, in **Science**, against the sensational newspaper reports of his work, disclaiming their "idiosyncracies," in the interest of the dignity of scientific research. **AMEN!!!**

SCOPE AND OBJECTS OF THE ACADEMY.

If the people of this region were fully aware of the importance of supporting the Southern California Academy of Sciences in its laudable undertaking, it is not to be presumed that they would lightly regard this duty and privilege. It must be that lack of information, misconception or other like cause which proper advertising can remove, is the true explanation of the evident luke-warmness.

In so far as clear statement of facts may aid in overcoming the obstacles which beset the pathway of those who hold dear the interests of this worthy organization, we feel called upon to do our part now and always.

This body is not, as some affect to suppose, a mutual admiration society, a foil for the aggrandizement or emolument of axe-grinders, or an arena for the ventilation of isms and the exploitation of cranks.

On the contrary, its objects, as plainly stated in the preamble to the Constitution, are:

(1) To promote intercourse among those who are cultivating science; (2) to elicit public interest in the results of technical investigation by the dissemination of correct information relating thereto; (3) the study of local natural features and phenomena; (4) the conservation of material illustrating local phases.

Quietly, consistently, faithfully, devotedly, without other reward than consciousness of duty done, the officers of the Academy have for years performed the arduous labors involved in what this platform inhibits. Those members whose life-work and self-sacrificing labors have entitled them to speak with authority, have unstintingly presented to us the fruits of their toil without compensation. Every one of the few dollars which have been contributed as membership dues has been made to yield its utmost in meeting the actual necessary routine expenses, and these have not yet reached anything like generous proportions.

Handicapped and in the face of obstacles which are not creditable to this community, to say the least, there has been a steady onward move. We are beginning now to reap the harvest from the earliest seed-sowing and a few willing hands are tilling and sowing for a future crop. There is urgent need for more seed and the time is fully come for its forthcoming to our hands.

We have new opportunity "**to promote intercourse,**" in the nearness to us of the world-famed enterprise in action on Mount Wilson. We sorely need all available resources "**to**

elicit public interest in the results of technical investigation," here in this fake-burdened land, being done to death with clap trap, wild cat schemes, brazenly deporting in the guise of science (God save the mark). Our "**study of local natural features and phenomena**," aside from the work being done under foreign auspices, is being woefully neglected, and "**the conservation of material illustrating local phases**"—well, we are pursuing the imbecile policy of letting the other fellow come and take it.

Now, it is to overcome all this neglect, to build up an institution to do and to save and to promulgate correct notions, that the Southern California Academy of Sciences is founded and incorporated, and for these sole objects are its working members striving.

We have a membership of about 250 and a circulation much greater to the Bulletin; 650 copies of this number will be printed. The exchange list has recently grown greatly, almost wholly through solicitation from prominent American and foreign Academies. By this means, the library is rapidly increasing. Collections are gradually accumulating, but for these there is nowhere a home and a place for exhibit.

What is needed now is broader advertising of the purposes and the operations of the Academy among the friends and neighbors of the members. Each one can aid materially by a word now and then, here and there, and by enlisting members.

A large edition of the Bulletin for October, 1904, containing the text of the Constitution and By-Laws, was published. Copies are to be had upon application at 534 Stimson Bldg., Los Angeles, of the Editor.

The officers elected in May to serve until June, 1906, are:

President, Melville, Dozier, State Normal School.

Vice President, John D. Hooker, 130 S. Los Angeles street.

Secretary, B. R. Baumgardt, 116 N. Broadway.

Treasurer, G. Major Taber, Laughlin Bldg.

William H. Knight, Times Bldg.

Professor A. B. Ulrey, University of Southern California.

Dr. C. A. Whiting, Pacific College of Osteopathy.

Dr. A. Davidson, Wilcox Bldg.

Dr. S. M. Woodbridge, South Pasadena.

Geo. W. Parsons, 138 S. Broadway.

Theo. B. Comstock, Stimson Bldg.

Dr. John Woodbridge is Assistant Secretary and Collector.

BULLETIN

OF THE

Southern California Academy of Sciences

Committee on Publication:

Theo. B. Comstock, S. D. A. Davidson, C. M., M. D., Wm. H. Knight.

CONTENTS

TRANSACTIONS FOR MAY	- - - - -	94
TRANSACTIONS FOR JUNE	- - - - -	95
ANNUAL REPORT	- - - - -	96
THE BEES OF SOUTHERN CALIFORNIA.	- - BY T. D. A. COCKERELL	99
A PRELIMINARY SYNOPSIS OF THE SOUTHERN CALIFORNIA		
CYPERACEÆ, X.	- - - - - BY S. B. PARISH	106

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MAILED OCTOBER 20, 1905

TRANSACTIONS FOR OCTOBER, 1905

I. ACADEMY SESSION.

Los Angeles, California, May 1, 1905.

The Annual Meeting and election of officers of the Southern California Academy of Sciences was held this evening at the State Normal School.

The balloting commenced at six o'clock in the evening, and closed at eight.

The result of the election was as follows:

President: Prof. Melville Dozier.

Vice President: J. D. Hooker.

Secretary: B. R. Baumgardt.

Directors: Messrs. Comstock, Whiting and Taber.

The lecture of the evening was by Prof. Fred. H. Beals, on "Wireless Telegraphy." A large audience was present which appreciated very much the method and presentation of the subject, which was illustrated with numerous experiments.

Adjourned.

Secretary.

II. MEETING OF DIRECTORS.

Los Angeles, California, May 1, 1905.

A meeting took place this evening at the State Normal School, with President Dozier in the chair.

Present: Dozier, Ulrey, Parsons, Comstock, Woodbridge, Davidson and Baumgardt.

Several accounts were presented, audited and paid.

The following applicants for membership were passed upon favorably: Homer Schieber, Oliver M. Foster, G. L. Holten.

In response to a letter of the President, Dr. Woodbridge, the Chairman of the Agricultural Chemical Section, was present and made a statement of the activities of the Section during the past year.

Dr. Woodbridge was requested by the Board to report to the Academy at the June meeting.

Adjourned.

Secretary.

III. MEETING OF SECTIONS.

1. Section of Biology.

State Normal School, May 8, 1905.

The meeting was called to order by the Chairman of the Section.

The minutes of the previous meeting were read and approved.

Owing to the unavoidable absence of the Secretary, Mr. F. C. Clark acted as Secretary pro tem.

Prof. Ulrey spoke briefly concerning some recent literature on advanced work in study of origin of species.

Then Dr. Bebb spoke upon the comparative anatomy of teeth and skulls of mammals and other animals. He answered many questions and gave much light upon many obscure points. The lecture was illustrated by good lantern slides.

After the lecture opportunity was given for all to examine a goodly number of skulls illustrating craniology and dentition of various mammals.

On motion the meeting adjourned.

C. A. WHITING, Secretary.

2. Section of Astronomy.

At the regular monthly meeting of the Astronomical Section, held May 15th, 1905, Chairman Knight presided.

The exercises of the evening, though not the result of a regularly devised program, were of interest and profit. Mr. Knight, as usual, presented a number of facts of current interest on astronomical questions, especially such as were associated with the planet Mars, now at its most favorable position for observation, being in opposition. He also gave some valuable information touching the structure and far reaching importance of the great solar telescope now being erected on Mount Wilson, and its bearing upon future investigation of the many problems connected with the central orb of our system. Mr. Knight's remarks called attention to the comparative merits of reflecting and refracting telescopes, which suggested the importance of knowing some of the fundamental principles of reflection and refraction.

Mr. Dozier took up this phase of the subject and, by blackboard illustrations, made clear the theory of light motion through media of different densities.

A ballot was then taken for the election of officers for the ensuing year, resulting in the re-election of the Chairman and Secretary who had served during the past year.

MELVILLE DOZIER, Secretary.

3. Section of Geology.

May 22, 1905.

The Geological Section met at the State Normal School Building at 8 p. m. Chairman Geo. W. Parsons gave an interesting talk on the necessity of obtaining good roads, water and sign posts on the desert for the benefit of the mining districts.

Remarks were made and the proposition was discussed by Professor Melville Dozier, Professor Chamberlin and Mr. G. Major Taber.

The meeting then elected the following officers for the ensuing year: George W. Parsons, Chairman; G. Major Taber, Secretary.

There being no further business, the meeting adjourned.

G. MAJOR TABER, Secretary.

4. Section of Botany.

The Botanical Section met at the Wilcox Building May 25.

Mr. Campbell-Johnston gave a history of the growth of the Santa Monica Experiment Station and a resume of the work that has been carried on there since it was first planted in 1888.

Description was given of the various eucalyptus trees growing there. Their suitability to different conditions was discussed.

The meeting then proceeded to the election of officers for the succeeding term. A. Davidson, M. D., was re-elected chairman, and Theodore Payne, was elected secretary.

C. RUSSELL, Secretary.

ANNUAL REPORTS FOR YEAR 1904-5.

The Academy of Sciences held its annual meeting June 5th, 1905, in the large hall of the State Normal School. President Dozier was in the chair and briefly in cheering words spoke of the successful proceedings of the year.

At the regular June meeting of the Academy held at the State Normal School, Los Angeles, on Monday evening, the 5th, the following reports were read, accepted and ordered filed:

I. REPORT OF THE SECRETARY OF THE ACADEMY.

The Secretary, Mr. B. R. Baumgardt, presented his reports as follows:

Los Angeles, California, June 5, 1905.

To the Board of Directors and the Members of the Southern California Academy of Sciences.

Gentlemen:—In accordance with the by-laws, I beg leave to present the Secretary's annual report for the fiscal year ending June 5, 1905.

It has been heretofore the custom of the Secretary to present a financial report on the occasion of the annual meeting, but in accordance with an agreement entered into with the Board of Directors, in the beginning of the present fiscal year, the Secretary was relieved from this part of the office. The financial report will be incorporated in the Treasurer's annual statement.

Membership.

At the beginning of the present fiscal year, there were 75 Fellows and 190 active members. During the year, 27 members have been added. The Academy has lost by death, removal and resignation, about 12 members. The membership at present is about 200.

Meetings.

The Academy has convened nine times during the past year, and each of the Sections have met the same number of times, in response to the call for monthly meeting.

A list of the lectures delivered before the Academy during the year, with the names of the lecturers, form a part of this report, and will be published in the June Bulletin.

The progress of the Academy, during the past year, has been in a measure handicapped by conditions which the Board of Directors have not been able to satisfactorily adjust. In the first place, the place of meeting has had a reactionary influence upon the attendance.

The Board, and, I believe, all the members of the Academy, recognize the courtesy extended to them by the Directors of the State Normal School in granting the Academy the privilege of meeting in this splendid auditorium. Owing to the fact that the income of the Academy is entirely limited to the membership dues, this arrangement has been of material aid to the successful manipulation of the Academy's financial affairs. Nevertheless, it would seem that the meeting place is not so situated as to draw the full strength of the Academy's personelle in attendance at the meetings. This is no doubt partially due to the hill that has to be climbed in order to arrive at the Normal School, and also partly to the distance of the meeting place from a street-car line.

If it were possible for the Academy to secure a more convenient and centrally located place for meeting, there would, no doubt, be a material increase in the attendance at the meetings.

A second handicap to the progressive advance of the interests of the Southern California Academy of Sciences is the need of an efficient

Secretary. Your present Secretary has served in this capacity in the past twelve years. Owing to pressure of private affairs, he has not been able to give the attention to the Academy's business that it requires, and which heretofore it has received.

The need of an efficient Secretary, with ample time to give to the details of the Academy's affairs—to its publicity, to its membership expansion, to its relationship with similar institutions throughout the land, as well as to the community in which it is located—is, perhaps, a more urgent need than anything else.

It is not to be expected that any institution, such as the Academy of Sciences, can make its influence felt properly until an officer can be secured, who can devote all his time to the promotion of the interests of the Academy. When the Academy has progressed far enough to warrant the fulfillment of these conditions, then—and only then—can such progress be attained. That this may come to pass in the near future is the earnest wish and hope of your present Secretary.

B. R. BAUMGARDT, Secretary.

In subsequent remarks Mr. Baumgardt urged the Academy to secure a larger attendance at its meetings and a larger membership, in view of the trifling expense at which more valuable scientific lectures were furnished without an alluring fee and not only to the members but to the general community.

Reports were then received from the chairmen of the several sections: Mr. Knight for the Astronomical, Prof. Ulrey for the Biological, Mr. Parsons for the Geological, Dr. Davidson for the Botanical, and Dr. Woodbridge for the Agricultural.

In pleasant terms President Dozier referred to the good work outlined in these transactions of the Academy.

Dr. Kress was then introduced and gave a most valuable and elaborate paper on the subject of "The Warfare Against Tuberculosis: What it Means." Numerous illustrations both instructive and impressive gave emphasis to the essay.

The Academy then adjourned to meet on the first Monday evening of October next.

II. REPORT OF THE TREASURER OF THE ACADEMY

The Treasurer, Mr. G. Major Taber, presented his report to the effect that during the year \$643.78 had been received and \$582.97 expended, and that a balance of \$60.81 remained in the treasury.

1. Section of Biology.

The Biological Section of The Southern California Academy of Sciences held seven meetings during the past year.

The following formal papers were presented in the order named:

"On the Structure and Functions of the Lumbar Enlargement of the Cord," Prof. C. A. Whiting.

"Some Unicellular Organisms Found in Westlake Park," Prof. A. B. Ulrey.

"Phosphorescence in Unicellular Organisms," Dr. Eleanore Seymore.

"Chlorophyll in Animal Forms," Prof. C. A. Whiting.

"Mammalian Ecology," Prof. Grunnell.

"Some Aspects of the Work of the City Bacteriologist," Dr. Leonard.

"Some Aspects of Cellular Chemistry," Dr. Edith Claypole.

"Some Recent Literature Relating to the Nervous System," Dr. Louisa Burns.

"Comparative Anatomy of Teeth and Skulls of Mammals," Dr. Bebb.

Aside from the formal papers brief reports were made as follows: Prof. A. B. Ulrey. Report. On some Organisms Collected in West-lake Park.

Hybrid Fishes, Prof. A. B. Ulrey.

Some Peculiarities of Cell Structure, Prof. A. B. Ulrey, Prof. C. A. Whiting.

2. Section of Geology.

Report of the proceedings of the Geological Section of the Academy of Sciences, from September 1904 to and including May 1905:

Oct. 24th, 1904 Mr. J. B. Lippincott read a paper on the "Reclamation Service of the U. S. Geological Survey".

Nov. 28th, 1904. Prof. W. L. Watts gave a lecture on the "Geology and Physical Geography of Southern Mexico", and Geo. W. Parsons gave a description of a recent trip to the City of Mexico and the surrounding country.

Jan. 23d, 1905. Prof. W. C. Mendenhall gave a lecture on the work of the U. S. Geological Survey with special reference to our watersheds and water supply.

Feb. 27th, 1905. Prof. Robt E. Ford gave a lecture on "How We Get Our Iron and Steel".

Mar. 27th, 1905. Rev. H. B. Gage gave a lecture on the minerals of Riverside County.

April 24th, 1905. L. Douglas Sovereign gave a lecture on "Gems and Curiosities of Southern California".

May 22d, 1905, open meeting George W. Parsons gave an interesting talk on the necessity of good roads, good water and water sign posts on the desert, and great necessity of all for proper development of the country's mineral and agricultural resources.

G. MAJOR TABER, Secretary.

GEO. W. PARSONS, Chairman.

3. Section of Botany.

The Botanical Section has held five meetings this year at which the following papers have been read:

"Flora of Clifton, Arizona," by Dr. A. Davidson.

"Desert Flora near Thermal," by Theodore Payne.

"The Californit Palm in Los Angeles," by Dr. A. Davidson.

"On San Jacinto Trails," by Mrs. Blanche Trask.

"Notes on the Flora and Fauna of Catalina Island," by C. F. Baker.

"The Flora of Amador County," by Ernest Praunton.

"History of the Forestry Station, Santa Monica," by A. Campbell-Johnston.

C. RUSSELL, Secretary.

The Bees of Southern California.

BY T. D. A. COCKERELL.

Emphoropsis interspersa, n. sp.

Male. Like *E. floridana* (Smith), but clypeus and lateral marks white; hair of cheeks long and white; hair of mesothorax strongly mixed with black; anterior femora with long white hairs behind; hind tibiae with white hairs on outer face; apical plate of abdomen extremely narrow.

Hab.—California (no other particulars known); from the Cresson collection, loaned by Mr. Viereck.

Emphoropsis semifulva, n. sp.

Male. Like *E. floridana* (Smith), but lateral face-marks better developed (more filled in above); strip on mandibles and scape in front cream-color; hair of cheeks long, abundant and white; hair of thorax above fulvous, that of mesothorax with black intermixed; hair of legs white, of middle trochanters and femora black (hind legs lost in type); hair of abdomen beneath largely pallid, at least in certain lights; apical plate broad, margined on each side with light fulvous pubescence. The hair of the region just above the hind coxae is black.

Hab.—California (no other particulars known): from the Cresson collection, loaned by Mr. Viereck.

The following table will be useful in the separation of the species of *Emphoropsis*. I give also *Anthophora abrupta*, which is easily confused with some of the forms of *Emphoropsis*.

- Entirely black, with black pubescence.....*tristissima* (Ckll.)
 Pubescence of thorax at least mainly light.....1.
 1. Abdomen with conspicuous entire light hair-bands.....2.
 Abdomen without such bands.....3.
 2. Clypeus all black (females).....*salviarum* (Ckll.)
 Clypeus with a reversed T in white (males) *salviarum* (Ckll.)
 3. Abdomen not bicolored, but with a rather thin pale
 pubescence all over.....4.
 Abdomen bicolored, i. e. black with the base hairy.....6.
 4. Clypeus, supraclypeal mark, lateral face marks, and
 front of scape creamy-white (males)....*johnsoni* (Ckll.)
 Clypeus black, with at most (in *miserabilis*) a small
 light spot 5.
 5. Hair of thorax profusely mixed with black; of hind
 tibiae on outside white (females).....*miserabilis* (Cr.)
 Hair of thorax yellowish-white, with a black patch in
 middle; of hind tibiae on outside orange (females)
 *johnsoni* (Ckll.)

6. Clypeus black (females).....7.
 Clypeus mainly or wholly light (males).....9.
7. Hair of thorax above with black intermixed; of occiput
 pale, but some black on vertex.....**murihirta**, Ckll.
 Hair of thorax above without black intermixed.....8.
8. Hair of occiput and cheeks all black....**floridana** (Smith)
 Hair of head pale, mixed with black on face and vertex;
 hair of thorax above bright orange-fulvous.....
 **pascoensis** (Ckll.)
9. Sides of clypeus broadly black; scape all black; hair
 of thorax above with black intermixed..**murihirta**, Ckll.
 Clypeus not thus margined.....10.
10. Hair of thorax above fulvous or ochreous, with black
 conspicuously intermixed.....11.
 Hair of thorax above without black intermixed.....12.
11. Hair of abdomen beneath all black; scape entirely
 black**interspersa**, Ckll.
 Hair of abdomen beneath largely pallid, at least in
 certain lights; scape white in front.....**semifulva**, Ckll.
12. Scape all black; hair of cheeks black; hair of hind
 tibiæ on outside black.....**floridana** (Smith)
 Scape white or yellowish in front.....13.
13. Hair of cheeks white; hair of hind tibiæ on outside
 white**morrisoni** (Cresson)
 Hair of cheeks black.....**Anthophora abrupta**, Say.

Of all of the above, except the **Anthophora**, I have studied types or cotypes.

Synhalonia belfragei subsp **virgata**, subsp, nov.

Female. Length about 12 mm., with a broad abdomen. Black; head and thorax with abundant pale pubescence, white on cheeks, pleura and face, slightly stained with ochreous on vertex and labrum, decidedly ochreous (without any black) on mesothorax and scutellum; mandibles above and below with some long golden or orange hairs; eyes (dry) dark grey-brown; facial quadrangle broader than long, but not excessively broad; vertex dullish, minutely roughened and punctured; antennæ black, last joint slightly longer than the one before; mesothorax dull (as in **melissodes actuosa**), minutely roughened and malleate; tegulae very dark brown. minutely punctured; wings clear basally, the apical part distinctly dusky, nervures piceous; second submarginal cell very broad, receiving the recurrent nervure near its end; wings quite hairy; legs black, hair on inner side of tarsi ferruginous; hair on apical half of middle tibiæ pale fuscous; basal joint of hind tarsi broad, its large apical hair-tuft fuscous with a ferruginous base;

hind knee-plate very small; tuft of hair on hind knees pale rufous; hind spurs long and perfectly straight; first abdominal segment with long hair; basal part of second to fourth with short pubescence which gives a grey surface with numerous little black specks, but extreme base of third and fourth, as well as of fifth, perfectly black; apical part of 2 to 4 with a broad band of rather silky dull white tomentum, narrowest on second; 5 has a similar band, but it is broadly stained in the middle with fuscous; apical plate obconical, rather broad, with perfectly even sides, the hair on each side of apical plate obconical, rather broad, with perfectly even sides, the hair on each side of it fuscous, shading into a warm red; venter with pale hair, stained with fuscous in middle of penultimate segment; second ventral segment chestnut red. Differs from typical *S. belfragei* (an Illinois specimen compared) by the strong ochreous tint of the hair on the thorax above; the darker, duller, punctured tegulae; the absence of a yellow tint in the wings and the broader second submargined cell. Differs from *S. fowleri* by the broader abdomen, with the bands not so white and not quite so broad; also by the color of the thoracic pubescence, and the very much larger second submarginal cell. Differs at once from *S. acerba* by the light hair of the legs; from *S. edwardsii* by having three white abdominal bands; from *S. fulvitaris* by the light pubescence of head.

Hab.—Los Angeles, Calif., two specimens (Davidson).

***Melissodes stearnsi*, n. sp.**

Female. Length 10 mm. or slightly more; black with dull white pubescence, tinged with ochreous on anterior part of mesothorax, tubercles, and slightly on abdomen; facial quadrate about square; eyes (dry) pale greenish; clypeus with large punctures; antennae from middle of fourth joint to end ferruginous beneath; last joint a trifle shorter than penultimate; mesothorax shining, strongly and closely punctured at the sides, impunctate in the middle; posterior two-thirds of mesothorax, and scutellum (which is well punctured) nude, or the extreme sides of these parts may have ochraceous hair, but there is no black hair; tegulae very dark brown, the tuft of pubescence pale; wings dusky, nervures piceous; second submarginal cell broad, receiving the recurrent nervure not far from the end; legs black, claw-joints red; hair of legs pale, that on inner side of basal joints of tarsi black; scopa of hind legs large, in the type full of orange pollen; abdomen convex and rather parallel-sided, not broad; first segment with pale hair on the basal half; segments 2 to 4 covered with appressed

greyish-white pubescence, often abraded; segments five and six with the pubescence mostly ochreous; the abdomen appears pruinose, but not banded; apical plate with the lateral margins concave; hair of venter pale reddish. A rather inconspicuous little species, not much like anything known to me.

Hab.—Los Angeles, Calif., two; Redondo, Calif., one, all collected by Dr. Davidson. Named after Dr. R. E. C. Stearns, the veteran naturalist of Los Angeles.

***Melissodes intermediella*, n. sp.**

Female. Length 10 mm. or slightly less; pubescence pale greyish or greyish-white; the broad bands of appressed hair on abdominal segments 2 to 4 white, not in the least ochreous; mesothorax shining and sparsely punctured, its hind part in the middle, and the disc of scutellum, covered with black hair; hair on inner side of basal joint of hind tarsi brown-black; hind knee-plate very short; pleura with long white hair; tegulae with a tuft of pale hair; second submarginal cell very broad, receiving the recurrent nervure beyond the middle, but not near the end; flagellum, except at base, dark red beneath; vertex without black hair; facial quadrangle broader than long, but not excessively broad.

This is the so-called ***M. intermedia***, Cresson, of the Mesilla Valley, New Mexico. By reason of the black hair of the apex of the abdomen, it cannot be the true ***intermedia***. An account of its maxillary palpi is given in *Annals and Magazine of Natural History*, Oct. 1903, p. 448. It is closest to ***M. humilior***, Ckll., of which it may possibly prove to be a variety, but the evidence now available suggests that it is distinct. A specimen from Los Angeles, Calif. (Davidson) must be referred to ***M. intermediella***. It is remarkable for the very shiny vertex, the brighter red of the under side of the flagellum, and the hind margins of the first three abdominal segments broadly reddish-brown. It is possible that it may be separated as a local race, but this cannot be determined without more material.

***M. intermediella*, var. *catalinensis*, n. var.**

A female collected by Dr. Davidson on Catalina I., Calif., has much black hair on vertex, and the hair of the anterior part of the mesothorax has a decided ochreous tint. The abdominal bands also have an ochreous tint, and the stigma and nervures are black or nearly so. The wings are dusky, considerably darker than in the type. The flagellum, except at base, is bright ferruginous beneath. The hind margin of the first abdominal segment is very narrowly brown, but the margins of the second and third are black. This may be a distinct species.

Melissodes gilensis, Cockerell.

San Pedro, Calif., July 11. (Cockerell). New to California.

Melissodes grindeliæ, Cockerell.

La Jolla, Calif., August (Cockerell). New to California.

The females of several species described or recorded above can be easily separated by the following table. I add also a species from Arizona.

- | | |
|---|---|
| Hair of fifth abdominal segment black or purple-black, except sometimes at extreme sides..... | 1. |
| Hair of fifth abdominal segment pale, sometimes dusky in the middle..... | 5. |
| 1. Hair of the thorax above fulvous, without black (Phoenix, Ariz., Oct. 8, at flowers of Helianthus annuus) | Melissodes aurigenia , Cresson. |
| Hair of thorax above with much black | 2. |
| 2. Larger; hair on inner side of hind tarsi clear ferruginous (San Pedro) | M. gilensis , Ckll. |
| Smaller; hair on inner side of hind tarsi black or dark brown | 3. |
| 3. Tegulæ with a tuft of black hair; subcostal nervure black or almost (La Jolla)..... | M. grindeliæ , Ckll. |
| Tegulæ with a tuft of light hair, subcostal nervure ferruginous; flagellum ferruginous beneath except at base...4. | |
| 4. Vertex without hair (Los Angeles)... M. intermediella , Ckll. | |
| Vertex with much hair (Catalina I.)..... | M. intermediella v. catalinensis , Ckll. |
| 5. Larger; hair on inner side of basal joint of hind tarsi clear ferruginous; hair of fifth abdominal segment with a blackish median stain (Los Angeles)..... | Synhalonia belfragei subsp. virgata , Ckll. |
| Smaller; hair on inner side of basal joint of hind tarsi black or almost..... | 6. |
| 6. Flagellum comparatively long, and clear red beneath (Los Angeles and Redondo)... Melissodes stearnsi , Ckll. | |
| Flagellum short and black (Los Angeles)..... | Diadasia laticauda , Ckll. |

Diadasia laticauda, n. sp.

Female. Length 9 mm. or slightly more; black, head and thorax with whitish hair, slightly tinged with ochraceous dorsally; mandibles with a golden patch near end; clypeus with very large strong punctures; antennæ short, black, the flagellum having only a faint brown tinge beneath; mesothorax shining, with rather strong punctures, wanting in middle, sparse near middle, more dense anteriorly; scutellum with

close small punctures; tegulae shining dark reddish-brown; wings nearly clear; second submarginal cell strongly narrowed above, and receiving the first recurrent nervure about the beginning of its last third; spur of middle tibiae moderately hooked at end; spurs of hind tibiae slightly bent at the end; hair on inner side of basal joint of hind tarsi chocolate color; abdomen very broad, even basally; first two segments shining, with little pubescence, third to fifth more or less covered with appressed ochreous hair; hind margins of second to fourth segments with conspicuous narrow pale ochreous hair-bands; margin of fifth segment, and apex, with ferruginous hair. Easily known from **D. diminuta**, Cresson, by the much broader abdomen, shiny and mainly naked at base, the naked hind part of mesothorax, and scutellum (the hairy anterior third of mesothorax contrasting). the olive-green eyes (blue-grey in **diminuta**), the stouter middle spurs, etc.

Hab.—Los Angeles, Calif. (Davidson). It appears that the spurs offer specific characters in **Diadasia**; thus in **D. enavata** the spur of middle tibiae is straight, at most a little bent at the end, while in **D. australia**, **rinconis** and **opuntiae** it is strongly hooked.

Diadasia nitidifrons, n. sp.

Male. Length about 8½ mm.: black, shining, with long loose dull white hair, not hiding the shining surface; eyes dark, probably purplish in life; clypeus with many small punctures; a low keel-like prominence between the antennae; antennae entirely dark; mesothorax shining, with numerous minute punctures; scutellum punctured like mesothorax; tegulae warm reddish brown; wings clear; second submarginal cell narrow, narrowed above, and receiving the recurrent nervure near its end; middle and hind femora, and hind tibiae incrassate; basal joint of hind tarsi curved, pointed but hardly produced apically; abdomen cordiform or obconical, shining black, with thin erect pale hair, hind margins of the segments very narrowly pallid, no hair-bands, apex bituberculate. Cannot be the male of **D. laticauda**, because of the quite different character of the punctuation of the mesothorax. It is easily known from **D. diminuta** and **D. apache** by the much less hairy abdomen, appearing black to the naked eye instead of whitish. It differs from **D. afflicta** by not having the basal joint of hind tarsi prolonged, and the quite different pubescence of the abdomen.

Hab.—Banning, Calif. (Davidson). It may be remarked that **D. tricineta**, Provancher, from Los Angeles, is placed by Fowler as a synonym of **D. enavata**; I do not believe this can be correct, but I am unable to see, from the description, wherein **D. tricineta** differs from **D. afflicta**.

Melissodes nigrifrons, Cresson, from California, is a species I have not seen. It may prove to be a **Diadasia**, as the description almost exactly agrees with **Diadasia nereia**, Fowler, differing, however, in having the flagellum subtestaceous beneath, and the pale hair of the abdomen confined to the first segment.

Synhalonia idiotes, n. sp.

Female. Length about 15 mm.; black, head and thorax with rather long pubescence, pale ochraceous dorsally, white beneath, nowhere mixed with black; head broad, facial quadrangle a little broader than long; clypeus entirely black, coarsely rugose-punctate; antennae dark, flagellum dark reddish beneath toward apex; third joint about as long as fourth and fifth together; labrum with reddish-orange hairs; mandibles black, blunt and simple; blade of maxilla about as long as eye; sixth joint of maxillary palpi narrower, but not shorter, than fifth; eyes (dry) dark greyish-brown; mesothorax microscopically roughened or tessellate, with distinct, well-separated, shallow punctures; scutellum more shining, with very close, minute punctures, variable in size: base of metathorax minutely roughened and dull; pleura closely punctured on a minutely roughened surface; tegulae dark reddish: wings somewhat dusky, quite hairy, the nervures dark brown; basal nervure meeting transverso-medial; first recurrent nervure joining second submarginal cell at its extreme apex; legs black, with long pale pubescence, that on the inner side of the tarsi orange-ferruginous; scopa of hind legs coarse, little plumose; spurs light reddish-brown, simple; knee-plate of hind legs very large, elongate and pointed, almost half the length of the tibiae; claws with divergent denticles; abdomen closely punctured, the hind margins of the segments strongly rufescent; first segment with long pale hair; segments 2 to 4 covered except apically with a dense tomentum, which is white basally (especially towards the sides), shading into pale grey, the whole giving the effect of narrow reddish and white bands running parallel, and separated by broader pale grey bands; fifth and apical segments with reddish-brown hair; hair of venter pale reddish, becoming whitish at sides.

Hab.—Rock Creek, California (Dr. Davidson, No. 72). A peculiar species, well distinguished from others by the short, broad blade of maxilla, the large elongate posterior knee-plate, and the absence of black basal bands on the abdominal segments. **S. idiotes** is the species recorded in Bull. So. Cal. Ac. Sci., IV. p. 14, as **melissodes** sp. from Rock Creek. It was taken for a **melissodes** before the palpi had been examined.

Triepeolus coquilletti, n. sp.

In Annals and Magazine of Natural History, Jan. 1904, p. 38, I recorded a female supposed to be **T. donatus** (Smith), collected by Mr. Coquillett in San Bernardino County, California. I have now compared it with genuine **T. donatus** from Maine, and it is certainly a distinct species, to be named as above. The differential characters are: Length about 10 mm.; pubescence of thorax and abdomen creamy-white; form much more slender; anterior and posterior bands on first abdominal segment broken only by linear interruptions, band on second segment entire.

ERRATA:

Page 31. **Anthophora urbana** is printed twice, the second one should be, **Synhalonia acerba**.

Page 32. **Colletes gandialis** should be **gaudialis**.

A Preliminary Synopsis of the Southern California Cyperaceæ.*

BY S. B. PARISH.

== Orifice of the beak entire, or at most emarginate. *Species of difficult determination.*

a. Perigynia ovoid or obovoid.

10. **Carex senta**, Boott, Ill. 4:174. W. Boott, in Wats. Bot. Cal. 2:242. Bailey, Proc. Am. Acad. 22:82.

Culms slender, rough on the sharp angles, 3 dm. tall; leaves 2-4 mm. wide, shorter than the culms; staminate spikes 1-2, sometimes with a very short spike at base; pistillate spikes 2-3, on short peduncles, 3-5 cm. long, 4-5 mm. thick; scales narrowly lanceolate, nearly as long as the perigynia, obtuse or subacute; perigynia obscurely 3-nerved on the outer face; achenes pale brown, orbicular, smooth, mucronulate.

Santa Inez Mts., above Santa Barbara; 350 Brewer, type. Santa Susana Mts., Feb. 1861; 218 Brewer. Near San Fernando, Feb., 1861; 218 Brewer. Cienega, Los Angeles Co.; Davidson, 1890. The Santa Susana Mts. are "near San Fernando" and the two specimens of 218 Brewer in the herbarium of the State University probably represent the same collection. Both are labeled "**C. Jamesii** Torr." and the first is so cited in the Botany of California. The species appears to have been seldom collected, but is probably confined to the coast region.

*Continued from page 84 (this volume), No. 5, 1905.



300

Stipa capensis (L.) Link.
Germ. in 1840
Hb. K.

Plate XIII. Brewer's type (No. 350) in the herbarium of the University of California. Photographed by Mr. W. G. Wright. Plate XX, Fig. 8. a. Achene. b. Scale.

- ✓ 11. **Carex auriculata**, Bailey, Mem. Torr. Club, 1:19. **C. Jamesii**, W. Boott in Wats. Bot. Cal. 2:243, in part.

Culms rough on the sharp angles, 4-5 dm. tall; leaves flat, 4-5 mm. wide, not longer than the culms; staminate spikes 2-3, the terminal 3-4 cm. long, pedunculate, the lower sessile, 1-2 cm. long; pistillate spike remote, sessile, 3-4 cm. long, 5 mm. thick; scales nearly equalling the perigynia, oblong, obtuse; perigynia nerved, 3 mm. long; achenes oblong.

San Bernardino Mts., Bear Valley, 6,500 ft.; 3278 Parish, June 24, 1896. Vivian Creek, 7,500 ft. alt.; 6406 Grant, July 23, 1904. The type was collected in 1852 by N. J. Anderson, at Coloma, and Bolander's 6208 and 6212, from Clark's Ranch and the Yosemite, are also cited by Bailey. It appears to be a species of high altitudes in the Sierra Nevada, and this is its southern limit.

- ✓ 12. **Carex Barbaræ**, Dewey in Torr. Bot. Mex. Bound. 231. Bailey, Proc. Am. Acad. 22:90; Mem. Torr. Club, 1:44. Parish, Zoe, 2:321. **C. aquatilis**, W. Boott in Wats. Bot. Cal. 2:241. **C. Prescottiana**, W. Boott, l. c. 244.

Culms stout, sharply triquetrous, scabrid on the angles; leaves 1 cm. wide, lax, nearly as long as the culms; staminate spikelets 2-5, the terminal 5-12 cm. long, the others approximate, sessile, nearly as long or much shorter; pistillate spikes 3-4, sessile, usually moderately distant, 6-10 cm. long; scales equalling the perigynia, narrow, acute or subacute; perigynia nerveless, 3 mm. long; achenes light brown, ovoid, mucronulate.

Growing in robust tussocks, often with a naked, trunk-like base 2-5 ft. high, on the borders of swamps in the Cismontane region below 2,500 ft. alt. Pasadena; 798 Braunton, 137 Grant. San Bernardino, 2144, 2145 Parish. North to Vancouver. The type was collected at Santa Barbara by Parry.

✓ Plate XIV. a. Perigynium x 8. Scale x 10.

b. *Perigynia ellipsoidal*.

- ✓ 13. **Carex austromontana**, n. sp.

Culms slender 5-7 dm. tall; leaves flat, long-pointed, 5-7 mm. wide, about equalling the culms; staminate spikes 3-4, approximate, the terminal 5 cm. long, the others 2-3 cm. long; pistillate spikes mostly 2, the lower 5-8 cm. distant, 3-5 cm. long, 6-8 mm. thick; scales shorter than the perigynia, narrow, lanceolate to oblong, obtuse or subacute; perigynia faintly nerved; achenes light brown, smooth, obovoid, contracted to a short neck, 2 mm. long.

PLATE XIV.



Carex Barbarae, Dewey

Growing in tussocks on stream banks in the higher mountains. San Bernardino Mts. Mill Creek 6,000 ft. alt., 2485 Parish, July, 1892, type; 5031 Parish, June, 1901. Bear Valley, 6,500 ft. alt., 3279 Parish, June, 1894. San Jacinto Mts., Round Valley, 9,500 ft. alt., Dr. Hasse, June 3, 1903.

Plate XV. Photographed from the type specimen, by Mr. W. G. Wright. Plate xx, Fig. 4. a. Achene. b. Scale.

✓ 14. **Carex Jacintoensis**, n. sp.

Cæspitose; culms slender, 3-5 dm. tall; leaves flat, 3-5 mm. wide, shorter than the culms; staminate spikes 1-3, the terminal 2-3 cm. long, the others much shorter; pistillate spikes 1-3, spaced, 1-4 cm. long, 3-5 mm. thick; scales shorter than the perigynia, oblong, obtuse or emarginate; perigynia ellipsoidal, or sometimes broader in the same spike, faintly nerved, 3 mm. long; achenes oblong.

Collected at high altitudes in the San Jacinto Mts., July and Aug., 1901, by Mr. H. M. Hall. 2461, Tahquitz Valley, 7,000 ft. alt. 2561, Fuller's Mill, 8,800 ft. alt. 2483, 2484, Tamarack Valley, 9,000 ft. alt. 2338, Deep Spring, 9,000 ft. alt. In Mr. Hall's Botanical Survey of San Jacinto Mt. these specimens are referred to **C. Hallii**, **C. Nebraskensis** and **C. nudata**.

Plate XVI. Photographed from the type specimen, by Mr. W. G. Wright. Plate xx, Fig. 3. a. Achene. b. Scale.

* * * *Staminate spike 1; pistillate spikes short, oblong, loosely flowered; perigynia pyriform, thick in texture, beakless; stigmas 2*

✓ 15. **Carex Hassei**, Bailey, Bot. Gaz. 21:5.

Stoloniferous by slender rootstocks; culms slender or filiform, 25-50 cm. tall; leaves thin, scabridous on the margins, 2-4 mm. wide, long-pointed, much shorter than the culms; bracts similar, the lowest slightly surpassing the inflorescence; staminate spike oblong, acute, 1 cm. long, pedunculate; pistillate spikes 1-5, cylindrical, the terminal often having 2-3 very short sessile spikes at base, the lowest remote and usually on a long peduncle; scales shorter than the perigynia, green with brown margins, ovate, cuspidate; perigynia green, obovoid, strongly nerved, 2-5 mm. long; achenes conspicuously beaked, filling the perigynia.

The type was collected by Dr. H. E. Hasse, in a bog near the head of the West Fork of San Gabriel River, 4,500 ft. alt. July, 1894. Seven Oaks, 6,000 ft. alt., in the San Bernardino Mts.; Hasse. In wet meadows, San Bernardino valley, 1,000 ft. alt.; Parish. The relationship of this plant is with **C. aurea**, rather than with **C. laxiflora**; it is too near **C. aurea celsa**, Bailey, Mem. Torr. Club, 1:75, indeed apparently identical with it.

Plate XVII. Plant x 1-3. a. Perigynium x 6. b. Scale x 10.



Carex austromontana, Parish

* * * * *Staminate spike 1; pistillate spikes globose or short cylindrical; perigynia firm and hard in texture, uninflated, hirsute, the straight beak bidentate; stigmas 3.*

† *Perigynia globose or ovoid, trigonous.*

16. **Carex globosa**, Boott. Linn. Trans. 20:125. W. Boott in Wats. Bot. Cal. 2:246. Bailey, Proc. Am. Acad. 22:125; Bot. Gaz. 10:206.

Culms slender, scabrid, 1-3 dm. tall; leaves 2-3 mm. wide, longer or shorter than the culms; bracts slender, the lowest exceeding the inflorescence, or shorter; pistillate spikes 1-3, loosely 2-9-flowered, the uppermost sessile, and approximate to the staminate spikes, the others pedunculate; scales equalling or exceeding the perigynia, green with purple margins, lanceolate, acute or cuspidate; perigynia green, 4 mm. long, stipe-like at base; achenes palid, granular-roughened, conformed to the perigynia.

Dry hills at Santa Barbara, March, 1861; 302, 303 Brewer. North to Oakland, and in the Yosemite Valley. In Brewer's specimens the perigynia are so sparsely hirsute as to appear glabrous on a casual inspection. Northern specimens are more densely clothed.

Plate XVIII. Drawn from Brewer's (No. 302). Plant x. a. Perigynium x. b. Scale x.

†† *Perigynia triquetrous.*

17. **Carex triquetra**, Boott. Linn. Trans. 20:126. W. Boott in Wats. Bot. Cal. 2:247. Bailey, Proc. Am. Acad. 22:127.

Culms smooth, erect, 3-6 dm. tall; leaves glaucescent, minutely scabrid, prominently many-nerved, 1-3 mm. wide, shorter than the culms; lowest bract grass-like, sheathing at base, the upper aristate from a scarious base; staminate spike erect, 1.5-2 cm. long, sometimes having a small basal spike; pistillate spikes 2-5, the uppermost subsessile, approximate, the lowest remote on a long or shorter peduncle, 1-3 cm. long; scales shorter and narrower than the perigynia, castaneous with green midvein and hyaline margins, ovate, concave, acute or mucronate, serrate on the back; perigynia greenish, ovoid, nerved in the intervals, 3-5 mm. long, terminating in a short, bidentate beak; achenes closely conformed to the perigynia.

Growing in clumps, and common on dry hillsides throughout the Cismontane region, below 2,000 ft. alt., from San Diego to Santa Barbara, where, probably, the type was collected by Nuttall. San Diego; Cleveland & Greene. Pt. Loma; Brandegee, 5078 Chandler. Encinitas; Ramona; Santa Catalina Island; Brandegee. Glendora; Grant. Ojai; Hubby. San Bernardino; Parish. According to Bailey, also at Lassen Co.

Plate XIX. Plant x. a. Perigynium x. b. Scale x.



Carex Jacintoensis, Parish

* * * * * *Spikes 1, staminate above; pistillate flowers few; perigynia firm in texture; stigmas 3; achenes closely conformed to the perigynia; bracts wanting.*

† *Pistillate flowers loosely disposed and alternately appressed to the flexuous rachis.*

- ✓ 18. **Carex multicaulis**, Bailey, Bot. Gaz. 9:117; Proc. Am. Acad. 22:128. **C. Geyeri**; W. Boott in Wats. Bot. Cal. 2:229, in part.

Culms stiff and erect, nearly smooth, obscurely angled, 3-6 dm. tall; leaves green or glaucescent, merely scabridous on the margins, 1-2 mm. wide, those of the culms 3-5 cm. long, the barren leaves nearly as long as the culms; staminate part of the spike narrow, imbricated, 1-2 cm. long; pistillate flowers 3-5, the lowest often remote; scales bract-like, aristate from a broad, scarious-margined base, or the upper muticous or obtuse, the lowest exceeding the spike; perigynia green, glabrous, obovoid-triangular, strongly nerved on the outer face, 4 mm. long, the lower ones narrow to a stipe-like base, 2-3 mm. long; beakless or nearly so, the orifice entire; achenes brown, minutely punctate.

Growing in clumps on dry declivities, at 3,000-6,000 ft. alt. in the Nevadan region. Mt. Disappointment; Davidson. Mt. Wilson; Grant. Mt. Lowe; McClatchie. Strawberry Peak; Mill Creek Falls; Parish. Cuyamaca Mt.; Brandegee. The latter station the southern limit; thence north to Southern Oregon.

✓ †† *Pistillate flowers aggregated at the base of the short linear staminate part of the spike.*

- ✓ 19. **Carex filifolia**, Nutt. Gen. 2:204. W. Boott in Wats. Bot. Cal. 2:229. Bailey, Proc. Am. Acad. 22:122. Britt. & Br. Ill. Fl. 1:339.

Cæspitose, culms very slender, smooth, 1-2 dm. tall; leaves filiform, shorter or a little longer than the culms; staminate part of the spike 3-5 mm. long; pistillate part ovoid to oblong or short cylindrical, 3-15 mm. long, 3-5 mm. thick; scales shorter and broader than the perigynia, scarious, brownish, concave, mostly obtuse; perigynia greenish and below ferrugineous, the upper part sparsely hirsute with very short, stiff hairs, obovate and obtusely trigonous, 3 mm. long, the short beak with an entire mouth; achenes brownish, smooth, 3-angled.

On a dry, stony hillside, Bear Valley, 7,000 ft. alt., San Bernardino Mts., June, 1886; 1784 Parish. The southern limit of the species; then thence north to British Columbia; also in Colorado and Nebraska.

PLATE XVII.



Carex Hasselii, Bailey

PLATE XVIII.



Carex globosa, Boott

BULLETIN

OF THE

Southern California Academy of Sciences

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CONTENTS

NEW VARIETY OF CORBULA LUTEOLA CPR., ETC.	
BY MRS. M. B. WILLIAMSON	118
FLORA OF CLIFTON, ARIZONA	130
BY DR. A. DAVIDSON	
CAREX TRIQUETRA. PLATE	132

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Some West American Shells—Including a New Variety of *Corbula Luteola* Cpr. and Two New Varieties of Gastropods.

By Mrs. M. Burton Williamson.

In his recent volume on West American Shells, Prof Josiah Keep lists 1,371 land, fresh water and marine mollusks. Allowing for a few duplicates that have inadvertently been listed, this list, if correctly numbered, with nine *Mangilias* and one *Cancellaria* that should be added, would make it reach 1,377 species. This is, by far, the longest list of West Coast shells that has been published.

But even this fine showing leaves several names that should be added. In my own collection there are a number that are not found in the list. Some of these may possibly be among the synonyms, but, for the most part they will be found new to it.

There is always a difference of opinion as to the value of a "variety" or varietal names, but, if they are listed for one species there can be no valid reason for omitting them from another—seeing that all classification is somewhat arbitrary. But with the elimination of such names from the following the list might still be found worthy of mention. As this list, with the exception of *Uvanilla* from San Clemente Island and one other shell, represents shells in my collection the limit of the article is necessarily restricted. Only marine forms are noted.

No attempt has been made, in this list, either at synonymy or bibliography; an occasional reference is given to recent works, (excepting Carpenter's and Cooper's), that would furnish a clew for further information.

AVICULIDÆ

Genus *Avicula* Lamark

Avicula sterna Gould.

Young specimen, Marine Ways, San Diego, Cal. Collected by Miss Polhamus and received from Dr. James Perrin Smith, Prof. Paleontology Leland Stanford Jr. University.

While found upon our California Coast this species may have to be classed among the adventitious ones. Dr. Wm. H. Dall, to whom the shell was referred, says of it that it "Was doubtless scraped off some vessel from the Gulf, as it has not been reported from North of the Gulf hitherto. A number of species have been obtained from the Ways where they haul small vessels up at San Diego, including a *Discinisca* and an *Acmaea*,

which were derived from this source, but they exist but a little while and do not propagate, the water not being warm enough for them. This source of error should always be kept in mind at localities where sailing craft are hauled out to be cleaned." Seceral specimens were collected in 1894, and these were labelled "San Diego," and distributed. Consult P. P. Carpenter's "Catalogue of Mazatlan Shells," page 148, for note on this species at Mazatlan and as far south as Panama.

MYTILIDÆ

Genus **Lithodomus** Cuvier

Lithodomus (Myoforceps) aristatus Dillw.

La Jolla, Cal, 1899, by Prof. F. W. Kelsey, of San Diego, who has collected many species of rare shells on our Southern California Coast. Dates and localities—unless stated otherwise—refer to time and collecting ground of specimens received by me. For habitat and synonymy of this species (**Lithophagus aristatus** Sol) see Carpenter's Maz. Shells, page 126.

PECTINIDÆ

Genus **Pecten** Müller

Pecten hericeus var. **hindsii** Cpr.

Dredged shells from Puget Sound from Fred L. Bulton, Esquire, who writes that **P. islandicus** from Puget Sd. is this shell. Consult Dr. Dall on the "Pelecypoda" in Trans. Wagner Free Ins. Scie., Vol. III, Part 4.

OSTREIDÆ

Genus **Ostrea** Linné

Ostrea amara Cpr. **O. luride** var.

On rocks, Quarantine, San Diego Bay, Prof. F. W. Kelsey. Dr. J. G. Cooper lists this "San Diego, California? to Panama," in his "Catalogue of W. North. Amer. and Many Foreign Shells, with their Geographical Ranges, for Labels, etc." State Min. Bu. Apr. 1894.

Ostrea conchaphila Cpr. **O. luride** var.

"On cans, bottles, shells, etc." (Prof. Kelsey), San Diego Bay. Reported fossil by Dr. Ralph Arnold, "Memoirs Cal. Acad. Sciences," Vol. III, page 49. Dr. Lorenzo Gordon Yates lists this in "The Mollusca of Santa Barbara, etc.," page 41.

VENERIDÆ

Genus **Paphia** Bolten**Paphia (Protothaca) grata** Sby.

Some years ago I collected one shell of this species in the drift at Terminal Island. Identified by Dr. Wm. H. Dall, U. S. Nat. Mus. "Synopsis of the Veneridæ" Wm. Healey Dall, (Proc. U. S. Nat. Mus. Vol. XXVI), page 397.

Dr. R. E. C. Stearns considers the common Redondo form of *Paphia* (Tapes), the northern aspect of **grata** rather than the southern of **staminea**.

TELLINIDÆ

Genus **Macoma** Leach**Macoma undulata** Hanley.

Young specimen, drift at Terminal Is. presumed by Dr. Dall to be this species, too young to be sure., "Synopsis of the Family Tellinidæ and of the North American Species" Wm Healey Dall, (Proc. U. S. Nat. Mus. Vol XXIII,) page 309.

Semele incongrua Cpr.

Dredged San Diego Bay in 1899 by Prof. F. W. Kelsey. In Dr. J. G. Cooper's Geog. Cat. of Moll.; "Catalina Id. 16 to 20 fathoms, rare."

CORBULIDÆ

Genus **Corbula** Bruguière**Corbula luteola** var. **rosea** var nov.

Valve on anemone in a rock pool on the old breakwater at Terminal Island.

As the name would indicate **Corbula luteola** is yellowish. But the disk of this variety is of a bright pink—like a brilliant **Telline carpenteri** Dall—excepting a ray of white from the beak across the umbonal portion; around the hinge area and the ventral margin the color is of a rosy flesh color; the interior of the valve is pink. The surface is sculptured with the same concentric lines as in the type. For a description and figure of typical **luteola** see Dr. Ralph Arnold's comprehensive volume upon our West Coast Mollusca under the title "Memoirs Cal. Acad. Sciences Vol. III—the Paleontology and Stratigraphy of the Marine Pliocene and Pliostocene of San Pedro," page 181, plate XVII, fig. 11, and "West American Shells" by Josiah Keep, A. M., page 87.

THRACIIDÆGenus **Asthenothærus** Carysentes**Asthenothærus villosior** Dall.

San Diego Bay, dredged by Prof. Kelsey. Identified by Fred L. Button, Esq. of Oakland.

Structural and systematic conchology by George W. Tryon, Vol. III, page 144, describes this bivalve and gives "Cape St. Lucas, L. Cal.," as its habitat.

TEREDIDÆGenus **Xylotrya** Leach**Xylotrya pennatifera** Blain.

In a big pile at San Pedro. This pile was from timber supposed to have been from Oregon. This specimen was identified by Dr. Wm. H. Dall.

"Sts. of Fuca to San Francisco," Cooper, Geog. Cal. Moll.

APLYSIIDÆGenus **Tethys** Linné**Tethys (Neaplysia) ritteri** Cockerell

At Crescent Beach, San Pedro Bay I found this species or variety of our *Aplysia* with the more common **A. californica** Cp. during the winter of 1904. I have sent the radula of this species to the well known English specialist, Prof. H. M. Gwatkin, but have not received the microscopic mount of it. If the radula should prove to be distinct from Dr. Cooper's species it would give value to a specific rather than a varietal one. Prof. Cockerell says of it, "This animal has the structure of **T. Californicus** (Cooper) which was also described from San Pedro, but the color scheme is so entirely different that it must be assumed that the species are distinct. Should any reason hereafter appear to the contrary, **T. ritteri** will at least be a very distinct variety." (The Nautilus Vol. XV., page 90.) Prof. Cockerell's description, excepting the color scheme, shows no marked difference from some of Cooper's **californica**. The fluid of **T. ritteri** is of a most beautiful reddish purple or violet color. A stain upon white paper has remained for months a rosy purple. The original description is given in the volume just referred to but for the use of the generic name "*Tethys*" rather than "*Aplysia*" see Dr. Henry A. Pilsbry's paper "On the Status of the Names *Aplysia* and *Tethys*," (Proc. Acad. Scie. Phila. 1895, pp. 347-350). For the Family *Aplysiidæ* consult Pilsbry's continuation of Tryon's Man. Conch. Vol. XVI. 1895-6.

ÆOLIDÆGenus **Æolis** Cuvier**Æolis (Facelina) iodenea** J. G. Cp.

Mud flats at San Pedro. Identified by Prof. T. D. A. Cockerell in 1901. In Dr. Cooper's Geog. Cat. he lists this species as **Phidiana iodinea** from "Santa Cruz to San Diego." Having no shells when adult, the Nudiabbranchiata proper are not included in Dr. Pilsbry's great work Manual of Conchology (Vol. XVI,) but as various forms of sea slugs are occasionally found in mud flats and under damp rocks a reference to them may be admissible. Fred L. Button, Esq., the well known Conchologist of Oakland, Cal., has listed a number of these interesting forms in his Systematic List of West Coast Shells—not yet published but a few copies have been distributed in MS.—The Dorididæ of Monterey Bay has been studied by F. M. MacFarland, Proc. Biol. Soc. Wash. Vol. XVIII, pp. 35-54. Dr. Wm. H. Dall describes a genus new to the Pacific Coast, **Phyllaplysia**, in **The Nautilus**, Vol. XIV, pages 91-92. This was found on sea-grass, Vancouver Island.

CLASS GASTROPODA.**PLEUROTOMA**Genus **Drillia** Gray**Drillia moesta** var. **maculata** var. nov.

Pt. Fermin, Los Angeles County.

Some years ago Dr. J. G. Cooper labelled this specimen **Drillia torosa** variety, and it is listed as such in my "Annotated List of the Shells of San Pedro Bay and Vicinity," (Proc. U. S. Nat. Mus. Vol. XV) page 208. The polished surface of this pretty shell—being more porcellanous than most of our California Drillias—the ground work bluish white with a yellowish band around each suture, also appearing in the body-whorl, the whole shell dotted, or spotted, with tiny, distinct spots mark it a definite variety from the type. Being covered with brown spots gives the shell a much darker appearance than **hemphilli**, another porcellanous form. In form, this var. is like **moesta**, or **maesta**, but the revolving ribs are more nodose, nearer like **torosa**, and less oblique; on the first three apical whorls these nodules are very faint and are not constant upon the body-whorl—disappearing upon part of it. As in **moesta** the ribs, or nodules, are lighter colored—showing the bluish white foundation. The suture is compressed and distinct and is tuberculated as in **moesta**, in this respect differing from **torosa**.

As the outer lip was broken—three specimens were collected

the same day, all with the aperture imperfect—no description of this part can be given. I only retained one specimen for my cabinet. Prof. Keep refers to a variety of **moesta** which he says "is smooth, with fine color lines." He gives San Pedro as the locality. I have no personal knowledge of other than the three I collected at the Point. It is not listed in his Check List. Length of shell 20 mm. For **Drillia moesta** consult Arnold's *Memoirs Cal. Acad. Sciences*, Vol. III, page 209, Tryon's *Mem. Conch.* Vol VI, page 183, plate 12, fig. 38 and Keep's *West Amer. Shells*, page 159.

Drillia torosa var. **aurantia** Cpr.

Monterey from Mrs. E. H. King.

This differs only in color from typical **torosa**. *Mon. Conch.*, by Tryon, Vol. VI, page 183.

MITRIDÆ

Genus **Mitra** Lamarck

Mitra fultoni E. A. Smith.

This is considered by some West Coast conchologists a variety of **M. maura** Swaino. The latter name was changed in 1893. to **M. idæ** by Prof. James Cosmo Melvill, M. A., F. L. S., and that name is now used by British conchologists, but not by conchologists in this country. Of **M. fultoni** Dr. Dall says he has seen none north of San Diego. **M. fultoni** and **M. maura** can readily be separated by collectors. My specimen was collected by Mr. Henry Hemphill.

NASSIDÆ

Genus **Nassa** Lamarck

Nassa mendica var. **elongata** Stearns.

Santa Catalina Island, Cal.

As the name would indicate this variety is of unusual length, the type measuring 22 mm. Five apical whorls show the strong ribs of var. **cooperi** but in the remaining two whorls these ribs are obsolete, the surface being marked with fine lines, many are considerably granulose. This var. was originally listed from a MS. name in "Annotated List of the Shells of San Pedro Bay and Vicinity," (*Proc. W. S. Nat. Mus.* Vol. XV), page 213, and no description was given.

COLUMBELLIDÆ

Genus **Columbella** Lamarck

Columbella (Astyris) carinata var. **hindsii** Rve.

San Diego, Cal., and Wash.

The value of the many variations of the forms **carinata** and **guasapata** is a debatable one but if some variations are admitted

then it would seem that this variety might be listed. My specimens were received from Mr. Henry Hemphill, that Master of Variations in Mollusca. Dr. Yates lists this var. in Bull. Santa Barbara Soc. Nat. Hist., page 44. Cooper's Geog. Cat. gives its locality "Neah Bay to San Diego."

MURICIDÆ

Genus **Murex** Linné

Murex californicus Hds.

Dredged 14 fathoms Pt. Fermin by Mr. Hubert Lowe, T. I. This white shell was labelled **P. trialatus** Sby., but not satisfactorily so, in my collection. Mr. Button pronounced it the above species. Tryon's Man. Conch., Vol. 11, page 113, plates 34 and 35, figs. 375 and 287. Dr. Dall in **The Nautilus**, Vol. XIV, page 38.

Genus **Ocenebra** Leach

Murex (Ocenebra) circumtexta var. **aurantia** Stearns.

San Pedro Bay, Cal.

This color var. of Dr. R. E. C. Stearns' species is described by him on page 16 of **The Nautilus**, Vol IX, as having bands of a "deeper orange" than the color of the shell. In typical forms of **circumtexta** these bands are "dark, sometimes almost black." My specimen was collected by Mrs. E. A. Lawrence in 1897.

Boreotrophon avelonensis var. **eucymatus** Dall.

Crescent Beach, San Pedro Bay. Identified by Dr. Wm. H. Dall. For description of species and variety consult Dr. Dall's bulletin, Proc. U. S. Nat. Mus., Vol. XXIV, pages 546-547.

Murex (Ocenebra) lurida var. **aspera** Baird.

Monterey Bay from Fred L. Button, Esq.

This var. is described, with synonymy, by Dr. Ralph Arnold in "The Paleontology and Stratigraphy of San Pedro," page 257, plate V, fig. 12. In Dr. J. G. Cooper's Cat. Cal. Fos. 1888 (7th Ann. Rep't. S. Min. Bu. for 1887), he makes this variety a synonym for **lurida** and in his label List, "Cat. W. North Amer. and Many Foreign Shells" he omits it. Dr. Lorenzo G. Gates lists this var. from Santa Barbara Channel (Bul. Santa Barbara Soc. Nat. Hist.).

SCALARIDÆ

Genus **Scala** Humphrey

Scala californica Sby.

Santa Catalina Is. Identified by Dr. Wm. H. Dall.

Scala subcoronata Cpr., **S. hindsii** var.

Crescent Beach, San Pedro Bay. Young shell identified by Dr. Wm. H. Dall as "subcoronata." In San Pedro Bay are two

fairly constant forms of **Scala hindsii** with and without prominently coronated varices or sharp ridges. Dr. Cooper's note on **S. hindsii** and **S. subcoronata**, page 3, State Min. Bu. (Bull. No. 4, 1894) does not state which form is correct for **hindsii**. There is evidently some confusion in the minds of West Coast collectors as to what constitutes typical **hindsii** if we consider **subcoronata** a synonym.

PYRAMIDELLIDÆ

Genus **Turbonilla** Risso

Turbonilla (Pyrgolampros) arnoldi Dall and Bartsch.

One specimen Santa Catalina Is., July 1902. Identified by Dr. Dall. For original description and figure of this species consult Arnold's "Paleontology and Stratigraphy of San Pedro," page 279, plate 1, fig. 7.

Turbonilla (Chemnitzia) panamense C. B. Ad. var.

San Pedro. Identified by Dr. Wm. H. Dall. P. P. Carpenter lists this species in his "Catalogue of Mazatlan Mollusca," page 427.

Turbonilla (Strioturbonilla) carpenteri Dall and Bartsch.

Young and worn specimen, Santa Catalina Id., July 1902, collected by Miss Estella M. Williamson. This specimen was also identified by Dr. Dall, Cur. Div. Moll., U. S. Nat. Mus.

For "Synopsis of the Genera, Subgenera and Sections of the Family Pyramidellidæ," by William Healey Dall and Paul Bartsch, see Proc. Biol. Soc. Wash., Vol. XVII, pp. 1-16.

Genus **Odostomia** Fleming

Odostomia (Isoæa) eucosmia Dall and Bartsch.

San Diego by Henry Hemphill and identified by Dr. Dall.

Odostomia exerata var. **armata** Cpr., **Parthenia armata** Cpr. San Pedro in 1897, from Mrs. T. S. Oldroyd.

As there has been a revision of Pyramidellidæ since this shell was identified this species may belong to the synonymy. As before remarked, unless otherwise noted dates refer to time I receive specimens. For description of this variety and also typical species see Carpenter's Cat. Mazatlan Mollusca, page 415, where both are described as species.

Odostomia (Menestho) grammatoSPIra Dall and Bartsch.

San Diego, Henry Hemphill. Iden. Dr. Dall.

This species has been called **Mumiola amiantis** Dall by some West Coast collectors.

For original description and figure of this species students are referred to Ralph Arnold's Memoirs, Cal. Acad. Sciences, Vol. III, page 285, plate 1, fig. 6x6a. Also to Dall and Bartsch's

Bulletin Proc. Biol. Soc. Wash., Vol. XVII, pp. 1-16, for genera and subgenera of this and the following.

Odostomia (Ivara) turricula Dall and Bartsch.

San Diego, Mr. Henry Hemphill. Iden. Dr. Dall.

This is the type of the Subgenus **Ivara** Dall and Bartsch. It has been labelled **Mumiola turricula** De Folin by conchologists. Memoirs Cal. Acad. Sciences, Vol. III, page 285, plate IV, fig. 14

CÆCIDÆ

Genus **Cæcum** Fleming

Cæcum magnum Stearns.

Dredged in San Pedro Bay by Herbert Lowe and myself. In San Diego, 15 fathoms by Prof. F. W. Kelsey. The San Pedro shells are not perfect, but I think there is no doubt about the San Diego specimens being correctly named. Memoirs Cal. Acad. Sciences, Vol. III, page 298, plate 8, fig. 16.

VERMETIDÆ

Genus **Vermetus** Adamson

Vermetus centiquadrus Val.

Marine Ways, San Diego, Mr. Henry Hemphill.

LITIOPIDÆ

Genus **Alaba** H. and A. Adams

Alaba oldroydi Dall.

Terminal Island, in drift, San Pedro, dredged 10 fathoms. Through the courtesy of Dr. Dall the name of this shell has, for some time, been known to West Coast students. He has only recently described it in **The Nautilus**, Vol. XIX, page 15.

RISSOIDÆ

Genus **Rissoa** Frémenville

Section **Amphithalamus** Carpenter.

Amphithalamus inclusus Cpr.

San Diego, Cal. Collected by Mr. Henry Hemphill, and identified by Dr. Wm. H. Dall. This is the type of Carpenter's section **Amphithalamus**. Tryon's Man. Conch. Vol. IX, page 317.

CALYPTRÆIDÆ

Genus **Crepidula** Lamark**Crepidula nivea** var. **glottidiarum** Dall.

On **Glottidia albida** Hds. on mud flats in San Pedro Bay by Mrs. W. H. Eshnaur. Not in my collection. Described in **The Nautilus**, Vol. XIX, No. 3, page 26, by Dr. Wm. H. Dall.

Crepidula rugosa var. **naticarum**, W.On **Lunatia lewisii** in San Pedro Bay.**Crepidula rugosa** var. **morrisiarum**, W.

Variety on **Norrisia norrisii** Sby. This and the preceding one were described in **The Nautilus** for Sept. Vol. XIX, page 50.

These varieties of **Crepidula** have been described since Prof. Keep's book was published.

NATICIDÆ

Genus **Lunatia** Gray**Lunatia pallida** Brod and Sby.

Victoria, B. C., from the Rev. George W. Taylor, in 1898. This species is described and figured in Tryon's *Man. Conch.* Vol. Vol. VIII. The Rev. George W. Taylor, F. Z. S., etc., says of this species that it "may easily be distinguished from the young of **L. lewisii** by the shape of the whorls and by its much smaller umbilicus." Preliminary Catalogue Marine Mollusca Pacific Coast of Canada, page 83.

Genus **Polinices** Montford**Polinices reclusiana** var. **alta** Dall.

This var. is occasionally found in San Pedro Bay. While the type has the spire only slightly elevated **alta** has a very elevated spire, the whorls, especially the body-whorl, being much flattened, giving the shell great length from the apex to the outer lip **below the columella**. I have one specimen that measures, in this way, 70 mm. in height, width 58 mm. Tryon's *Manual of Conchology*, Vol. VIII, describes what appears to be a variation rather than typical **reclusiana**: the figure, plate 12, fig. 1, is also that of an elongated form. Consult Arnold's *Memoirs. Cal. Acad. Sciences*, Vol. III, for typical **reclusiana** and this var.; also Keep's *W. Amer. Shells*, page 228, for description and figure of typical species.

ACMÆIDÆ

Genus **Acmæa** Eschscholtz**Acmæa patina** var. **scutum** Esch.

Occasionally found with the type: it is readily detected, being thinner and having the "spot" in the interior darker. If

this and the following variety are eliminated some other *Acmæas* might as consistently be relegated to the synonymy.

***Acmæa scabra* var. *limatula* Cpr.**

Various "Points" in Los Angeles Co., also on the old break-water.

This var. has a dark band around the edge of the interior of the shell. Some years ago it was identified for me by Dr. R. E. C. Stearns. Tryon's *Man. Couch.*, Vol. XIII, page 14, figs. 38, 39, 40.

TURBINIDÆ

Genus ***Uvanilla*** Gray

***Uvanilla regina*. Stearns.**

San Clemente Island, by Mr. Chas. H. Lawrence.

This rare shell was first described by Dr. R. E. C. Stearns, U. S. Nat. Mus., in **The Nautilus**, Vol. VI, page 85, and, Proc. U. S. Nat. Mus., Vol. XVI, pp. 350-51, also listed in his bulletin on "The Shells of the Tres Marias," etc. The finding of this shell on San Clemente Is., S. Cal., gave a new locality and Dr. Stearns noted its occurrence on pages 1 and 2 in **The Nautilus** for May, 1897. The first shell was from Guadaloupe Island, off the coast of Lower California.

TROCHIDÆ

Genus ***Calliostoma*** Swainson

***Calliostoma canaliculatum* var. *parvum* var. nov.**

San Diego Bay. Prof. F. W. Kelsey.

This variety is like a dwarfed ***canaliculatum***, but instead of having a plain ash or yellowish colored surface the whorls of this shell are beautifully mottled with pale brown and white flecks, these are especially pronounced around the sutures and the angle of the body-whorl. Tryon's *Man. Couch.*, Vol. XI, page 361, says "Specimens from Vancouver are much smaller than the southern (Monterey) shell and have fewer spiral liræ, the alternate ones being lost; the interstices are chocolate colored." (Fig. 49, plate 67.) As some ***C. canaliculatum*** also lose their smaller spiral liræ this cannot be considered a varietal exception. A very prominent beading ornaments the coarser spiral ridges, this beading being more pronounced than on typical ***canaliculatum***. The size and color markings are distinct features.

HALIOTIDÆ

Genus ***Haliotis*** Linné

***Haliotis cracherodii* var. *splendidula* Dall.**

Point Vicente, Los Angeles County.

This variety was published from a MS. name in shells of San Pedro Bay (Proc. U. S. Nat. Mus., Vol. XV, page 198).

This interesting variety of **cracherodii** was found near a camp fire evidently built at the lonely spot by fishermen, as the shells appeared to have been brought ashore from rather deep water. The exterior is like **cracherodii** but the interior is beautifully mottled with green and blue—as in **fulgens**—with brown blotches. In my two examples there are six holes in each. Since these shells were found, in 1890, I have not found this variety.

ORDER POLYPLACOPHORA

Sub-Family **Callistoplacinae**

Genus **Callistochiton**

Callistochiton decoratus var. **punctocostatus** Pils.

Monterey, Fred L. Button, 1899.

Of this chiton Dr. H. A. Pilsbry writes, it is "An interesting and rare form. It was unknown to me at the time I prepared the monograph in Manual of Conchology, but I have seen several since." For this genus see Pilsbry's continuation of Tryon's Man. Conch., Vol. XIV. See "Nautilus", Vol. X, page 50, 1896.

CLASS CEPHALOPODA

OMYCHOTEUTHIDÆ

Genus **Loligo** Lamarck

Loligo stearnsii. Hemphill.

Egg cases, San Pedro Bay.

Egg clusters of *Loligo* presumed to have been the above species were collected in the channel. Dr. Cooper listed this shell from "San Francisco Bay" in his "Cal. W. North Amer. and Many Foreign Shells, with Their Geographical Ranges, for Labels," etc. (State Min. Bu., Apr., 1894.)

Los Angeles, California, Oct. 9, 1905.

*Flora of Clifton, Arizona.

By A. Davidson, C.M., M.D.

ROSACEÆ

- *Prunus serotina* Ehrh. Blue river.
- Spirea discolor dumosa* Wats. Coronado Mine.
- Rubus trivialis* Michx. Longfellow.
- Cercocarpus betulæfolius* Nutt. Wood road Metcalf.
- Cowiana mexicana* Don. Banks of Frisco river. Aug.

SAXIFRAGACEÆ

- Fendleri rupicola Wrightii* Gray. Johnson's ranch. Sept.
- Ribes aureum* Pursh. Duncan. April.

CRASSULACEÆ

- Cotyledon* ? Chase Creek.
- Sedum wootoni* B. & R. Wood road Metcalf.

LYTHRACEÆ

- Lythrum californicum* T. & G. Clifton; Duncan.

ONAGRACEÆ

- Lavauxia triloba* Spach. Generally distributed. April.
- Oenothera albicaulis* Pursh. Guthrie. April.
- Oenothera brevipes* Gray. Common.
- Oenothera caespitosa* Nutt. Frequent. April.
- Oenothera pallida* Lindl. Clifton and Blue river. Summer.
- Oenothera nuttalli* T. & G. Common. April.
- Sphaerostigma erythrea* Davidson. Common on the slopes of the river South of Clifton; the type locality. April.
- Eulobus californicus* Nutt. Rare, near Clifton. April.
- Gaura parviflora* Dougl. Duncan; Longfellow. Aug.
- Gaura coccinea* Nutt. Duncan. May.
- Zauschneria arizonica* Davisson. Chase Creek two miles above Metcalf, the type locality. It is fairly abundant on the moist creek bottom. Sept.

UMBELLIFERÆ

- Leptocaulis echinatus* Gray. Frequent. April.
- Peucedanum orientale* C. & R. On stony slopes. Type locality North Clifton. Not uncommon. April.

*Continued from Page 36.

Aletes davidsoni C. & R. Canyon at the foot of the Coronado incline is the type locality. Also in Metcalf woods. June to Oct.

Daucus pusillus Michx.. Chase Creek.

CAPRIFOLIACEÆ

Lonicera dumosa Grey. Near Coronado mine. April.

RUBIACEÆ

Galium aparine vaillantii Koch. Not uncommon.

Galium proliferum Gray. On stony slopes.

Galium wrightii Gray. Common in rock crevices.

Galium microphyllum Gray. Chase Creek.

LOBELIACEÆ

Nemacladus ramosissimus Nutt. Frequent. April.

Lobelia splendens Willd. Chase Creek.

CAMPANULACEÆ

Specularia perfoliata DC. Coronado Mine.

ERICACEÆ

Arctostaphylos pringlei Parry. Chase Creek. May.

Arctostaphylos manzanita Parry. Chase Creek.

PRIMULACEÆ

Androsace arizonica Gray. Shady banks, Gila river. April.

OLEACEA

Fraxinus pistaciæfolia Torr. Chase Creek.

Menodora scabra Gray. Generally distributed. August.

APOCYNACEÆ

Amsonia palmeri Gray. In low grounds on river banks. Clifton. April.

HYDROPHYLLACEÆ

Nama hispidum Gray. Common. April.

Eriodictyon glutinosum Benth. Frequent.

Phacelia ivesiana Torr. Chase Creek. May.

Phacelia micrantha Torr. Chase Creek. May.

Phacelia distans Benth. Chase Creek. May.

Phacelia ramosissima suffrutescens Parry. Coronado Mine. May.

Phacelia crenulata Torr. Frequent. April.

Phacelia integrifolia Torr. Common. April.

Phacelia integrifolia palmeri Gray. Common. April.

Phacelia circinata Jacq. Dry woods above Metcalf. July.

PLATE XIX.



Carex triquetra, Boott

BULLETIN

OF THE

Southern California Academy of Sciences

Committee on Publication:

Theo. B. Comstock, S. D. A. Davidson, C. M., M. D., Wm. H. Knight.

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CONTENTS

Transactions of the Academy	- - - - -	120
Recent Literature	- - - - -	121
Cereus Giganteus	- - - - -	122
Lichens of San Jacinto Mountain	- - - - -	123
Synopsis of Southern California Cyperaceæ	- - - - -	126

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TRANSACTIONS OF SOUTHERN CALIFORNIA ACADEMY OF SCIENCES.

Histological Laboratory, The Pacific College of Osteopathy.

November 13th, 1905.

The meeting was called to order by the Chairman of the Section. Minutes of the previous meeting—May, 1905—were read and approved.

The first work of the evening was a very interesting presentation of some points in Comparative Anatomy by Mr. F. C. Clark. Mr. Clark's talk was thoroughly illustrated by the fine collection of skeletons which he is preparing for The Pacific College of Osteopathy. Among the skeletons is one of a full grown ostrich.

C. A. Whiting presented a brief description of the structure of the ovary and the development of the ovum. The talk was illustrated by a considerable number of specimens prepared for microscopic examination. About forty members and visitors were present.

The Section adjourned to hold its December meeting in the Biological Laboratory of the University of Southern California.

C. A. WHITING, Secretary.

Lecture Room of the University of Southern California.

Biological Section of the Southern California Academy of Sciences.

December 11th, 1905.

The meeting was called to order by the Chairman of the Section. The minutes of the last meeting were read and approved.

The lecture of the evening was delivered by Dr. Leonard, City Bacteriologist, on "The Water and Milk Supply of Los Angeles."

The lecture was of such importance that it will be presented at length in the next Bulletin.

Before the lecture, the Chairman of the Section, Prof. Ulrey, conducted the Members of the Section and the Visitors through the magnificent laboratories just completed by the University of Southern California.

About 65 Members and Visitors were present.

On motion the Section adjourned to hold its January session conjointly with the regular meeting of the Academy.

C. A. WHITING, Secretary.

BULLETIN OF SAN DIEGO SOCIETY OF NATURAL HISTORY.

We are glad to note the first publication of the San Diego Society of Natural History. Vol. I, No. 1, contains two papers, I. "Life Areas of California," by Frank Stephens. In the course of this article the author has subdivided the recognized zones into faunal areas, bearing the names of the locality showing the most characteristic fauna. II. "Address on Books Relating to Neology, Mineral Resources and Paleontology of California," by A. W. Vodges. This is a valuable bibliographical paper, but not quite as perfect as it might be. The various articles nearing on this subject that have been printed in this magazine are wholly overlooked.

"The Vitality of Buried Seeds."

Under the above title the U. S. Department of Agriculture have published the results of their experiments at Arlington. One hundred and twelve different varieties of common seeds, grasses, weeds, etc., were buried under conditions as nearly natural as possible for varying periods.

The summary of their results are as follows:

These results, while unsatisfactory, show clearly that it is the hard seeds in the clovers which remain over in the soil for some considerable time. The alsike clover, No. 50, behaved practically the same as the sample of red clover first mentioned. The Lespedeza, or bush clover, No. 43, gave results very similar to the white clover. The alfalfa, No. 59, gave a germination of only 2, 9, and 9 per cent, respectively, for the different depths. But in all cases a few fresh sprouts were present when the seeds were taken up, showing that the seeds were germinating and afterwards decaying.

The length of time that seeds will retain their vitality when buried in the soil is of much importance in the extermination of weeds.

The seeds of many of our pernicious weeds can be destroyed by deep plowing, if the soil is left undisturbed for some time.

NEW SHELLS.

Two new varieties of *Crepidula rugosa*. Nutt. Are described by Mrs. M. Barton, in "The Nautilus," Sept. 1, 1905.

PUBLICATIONS RECEIVED.

"Annals of the Carnegie Museum." Vol. III, No. 3.

"Commercial Fertilizers," by G. Roberts. University of California. Bulletin No. 171.

"Studies in Grasshopper Control," by J. S. Hunter. University of California. Bulletin No. 170.

"The Mexican Cotton Ball Weevil." U. S. Dept. of Agriculture. Entomology Bulletin No. 51.

"Root-Maggots and How to Control Them." U. S. Dept. of Agriculture. Circular No. 63.

"Manufacture of Dry Wines in Hot Countries," by F. T. Bioletti. University of California. Agricultural Bulletin No. 167.

"Memoirs of the Carnegie Museum." Vol. II, Nos. 2 to 5.

RECENT LITERATURE.

The Butterflies of the west coast of the United States. By William Greenwood Wright. Pp. 257. VII Pl. 1-32 Whitaker & Ray Co., San Francisco, 1905.

California has every reason to be proud of this handsome quarto. The neat binding, the broad-margined page, the paper and the press-work, characterize it as a worthy example of good bookmaking, while the plates represent the highest attainment of the art of photographic color-printing. It is not too much to say of them, that they equal in beauty, and excel in accuracy, the hand-colored photos of Erward's great work.

In interest and importance the contents are worthy of their fine dress. For twenty-five years the author has been a diligent student of the lepidoptera of western America. He has studied them in the field from Alaska to Mexico, so that he has come to know intimately almost every species and form that flies in that vast territory. Naturally the work of such a student, and in a field so little explored, is full of original and valuable matter. And science is fortunate that the author has recorded in this permanent form so much information that no other has acquired.

The first thirty-two pages are occupied by a discussion of the general features of butterfly life. This is succeeded by a complete list of the butterflies of the United States, with their respective ranges, those

of the western coast being distinguished by heavy-faced type. This brings us to the main body of the work: the description of all the known butterflies of the West Coast. The author recognizes 483 species and varieties in this territory, 16 species and 13 varieties appearing here for the first time. With but 53 exceptions, each butterfly is represented on the plates by from one to seven figures, portraying them in their natural colors, and in different aspects. As an appendix three species of day-flying moths are described and figured.

The descriptions, while sufficient, are not strictly technical in form, but such as can be understood by any intelligent person, so that, aided by the life-like figures, it would be quite possible for one entirely unlearned in Entomology to identify, by means of this book, almost any butterfly he might find in western North America. The notes on the habits, ranges, and other points of interest concerning the different species and varieties, are a mine of original observations, to which future writers will resort for treasure. For the work is unlikely ever to be superseded, but is rather destined to remain as the basis of all knowledge of our western American butterflies.

S. B. P.

CEREUS GIGANTEUS IN CALIFORNIA.

The occurrence of the giant cactus in California has long been a matter of uncertainty. Probabilities are favorable, and its presence has been reported in several publications, but in every instance the report was found to have no authentic basis. The question has now been set at rest by the explorations of Dr. D. T. McDougal, of the New York Botanical Garden, who, in March, of the present year, descended the Colorado River from Mellen, Ariz., to the mouth of the Hardy. In Arizona he found this cereus as far north as Bill Williams Fork, near the mouth of which stream it crossed over to the mountains on the California side of the Colorado. This would locate it at Monument Peak in the Southeastern corner of San Bernardino County.

S. B. P.

VARIABILITY OF EUCALYPTUS UNDER CULTIVATION.

J. H. Maiden, the well known authority on this species, says that the new species of Eucalyptus described from specimens grown outside of Australia are but cultivated variations and cannot be considered as true species.

This decision will affect the nomenclature of some of the species described in "Eucalyptus," by Abbot Kinney.

THE CALIFORNIA POPPY.

Dr. E. L. Greene, now of the United States National Museum, of Washington, has in "Pittonia," Vol. V. Part 23, revised the whole Eschscholtzin genus. The fruits of his labors are somewhat surprising. Instead of the 10 or 12 species we supposed California possessed, he has catalogued 112 of which 38 are perennial. As the author has given close attention to this genus for many years, we may accept his conclusions as legitimate and his work as a monument of patient, scientific toil.

A Few Lichens Picked up on San Jacinto Mountain

By Dr. H. E. Hasse.

- Leptogium albociliatum**, Desm.
Leptogium Californicum, Tuck. Among moss on rocks.
Leptogium pulvinatum (Huds.) Mont.
Calicium parietinum Ach. Spores ellipsoid, 8-9 micromes long, 4 micr. thick, simple, dark. On decorticated dead oak. Keen-Allen's Camp.
Ramalina calicaris farinacea, Shaer. Twigs. Sterile.
Evernia vulpina (L.) Ach. On pines, Strawberry Valley.
Cetraria Californica, Tuck. On pines, Strawberry Valley. Frequent.
Alectoria Oregana, Tuck. Lichenes Japoniae, Nyl. 1890, pag. 104 Thallus brown, fruticulose. Apothecia terminal with ciliate margins not unlike *Usnea barbata florida*. Spores 7-9 micromes long by 6-7 thick, simple. Sterigma straight and short, straight Spermatia. Keen-Allen's Camp on limbs of *Pinus ponderosa*. Also found on *Pseudotsuga macrocarpa* on Mt. Wilson, San Gabriel Range and probably throughout the mountains of Southern California and northward to Oregon, the type locality.
Alectoria Fremonti, Tuck. Frequent on pines but rarely in fruit. At Keen-Allen's Camp.
Parmelia physodes enteromorpha, Tuck. Throughout the range on shrubs and trees.
Parmelia tiliacea, (Haffm.) Floerk. Oaks-Strawberry Valley.
Parmelia olivacea, (L.) Ach. On oaks and pines, Strawberry Valley.
Parmelia prolixa, Ach. (Tuck. Syn. N. A. Li. I) *P. prolixa*, Nyl Crombie, Br. Li. 1984.)—Rocks, sterile.
Parmelia olivacea aspidota, Ach. Sterile, together with the type.
Parmelia perlata, (L.) Ach. Sterile, on pines. Lobes sparingly sorediate on the margins.
Physcia stellaris, (L.) Oaks, Strawberry Valley.
Physcia pulverulenta, Nyl. On rocks, sterile and oaks, fertile.
Physcia pulverulenta angustata, Nyl. Oaks, Strawberry Valley.
Physcia pulverulenta, Nyl. Subsp. *Ph. isidiigera*, A Zahlbr. A new subspecies for the name of which I am indebted to Prof. A. C. Herre of San Jose, who first collected the lichen in the Santa Cruz mountains and sent it to Dr. Zahlbruckner.

Physcia ciliaris, (L.) DC. Sterile on oaks near Strawberry Valley.

Theloschistes lychneus, Nyl. Oak bark.

Placodium elegans, (Link.) DC. Not found below 275 meters. Around Long Valley near base of Tauquitz Peak.

Placodium ferrugineum, (Huds.) Hepp. form *festivum* Nyl. Crombie I, l.c. pag. 376. Thallus absent. Found at all elevations throughout the state and coast islands. San Miguel (Trask). Santa Cruz Mts. (A. C. Herre).

Placodium vitellinum, (Ehrh.) Naeg. & Hepp. Spores one-septate and simple.

Lecanora rubina, (Vell.) Ach.

Lecanora rubina opaca, Ach. Both, like *Placodium elegans*, grow at higher elevations and are often found together.

Lecanora muralis, (Schraeb.) Schaer.

Lecanora muralis diffracta, Fr. The former at lower elevations, while the latter favors higher altitudes. On granite.

Lecanora subfusca allophana, Ach.

Lecanora sambuci, Cromb. l.c. p. 443.

Lecanora varia saepincola, Fr. Dead pinewood. Wide spread. San Mateo Co. and foothills near Stanford University. (C. F. Baker.)

Lecanora varia symmicta, Ach. Dead pine wood.

Lecanora cinerea (L) Somm. Rocks.

Lecanora cinerea gibbosa, Nyl. Rocks. Spores 28 by 20 micromes, spore-contents finely granular with one or two nucleoles.

Lecanora glaucocarpa, (Wahl.) Ach. Granite, Strawberry Valley.

Lecanora chlorophana, Ach. Same habitat and locality.

Rinodina, (Ach.) Mass. Rocks.

Rinodina sophodes, (Ach.) Nyl. With lecidine Apothecia. On oaks at Strawberry Valley.

Rinodina radiata, Tuck. Granite.

Urceolaria scruposa (L.) Nyl. On earth and rocks.

Biatora holopolia, Tuck. Syn. N. A. Li. II. Spores 8 to 9 micromes long, 4 to 4½ thick, binuclear. Thecae 40 micromes long, 8 thick. Hymenium 56 micr. high, faintly reddish brown; Epithecium red-brown, hypothecium colorless. On decorticated dead pine logs, Strawberry Valley.

Lecidea protabacina, Nyl. On granite. Not under 275 meters altitude and at like elevation in San Gabriel Range on San Antonio Mt.

Lecidea enteroleuca, Fr. Tuck. l.c. II. (L. parasema, Ach. v. elaeochroma Ach. Leighton Li. Gr. Br. ed. 3 p. 269.) Sp. blunt ellipsoid 16 micromes long, 7 thick. Hypothecium pale. On pine logs, Strawberry Valley.

- Lecidea enteroleuca achrista**, Sommerf. Bark of dead pine branches and living oaks.
- Lecidea tessellata**, Floerk. Sp. 16 micros long, 6 thick, bluntly ellipsoid.
- Lecidea variegata**, Fr. Sp. 12 micros long, 5 thick. Granite.
- Lecidea fusco atra**, (L.) Fr. Sp. 16 micros long, 8 thick. Granite.
- Lecidea auriculata**, Th. Fr. Paraphyses thick (3-4 micr.) distinctly articulated.
- Lecidea atrobrunnea**, (DC) Schaer. Thallus scales whitish margined, hypothecium almost colorless. Granite.
- Buellia petraea**, (Flot.-Koerb.) Tuck.
- Buellia geographica**, (L.) Tuck. At 275 meters altitude. Granite rocks, Long alley near base of Tauquitz Peak.
- Buellia oidalea penichra**, Tuck. Pinus ponderosa, Strawberry Valley.
- Buellia myriocarpa**, (DC) Mudd. Dead pine wood.
- Buellia Bolanderi**, Tuck. Granite.
- Buellia parasema triphragmia**, Nyl. (B. triphragmia, Nyl.) Dead pine wood, Strawberry Valley.
- Verrucaria punctiformis**, Ach. var. diminutida, Nyl. Spores 24-28 micros long, $7-7\frac{1}{2}$ thick, one septate, the upper part broadest, division bi nucleate at times faintly 3-septate. Theca 52 micros long, 28 thick. On living oaks, Keen-Allen's Camp.

A PRELIMINARY SYNOPSIS OF THE SOUTHERN CALIFORNIA CYPERACEÆ. VIII.*

By S. B. Parish.

**Perigynia* Stramineous or greenish, as are the scales, so that the spikes appear light in color; the long beak bidentate; stigmas 3; pistillate spikes erect, except No. 2; bracts not auriculate.

+*Perigynia* thin and firm in texture, tapering into a beak one-third as long as the body; staminate spike solitary, except No. 1.

++*Perigynia* glabrous, inflated and not filled by the achene.

1. **Carex utriculata** Boott; Hook. Fl. Bor. Am. 2:221:W. Boott in Wats. Bot. Cal. 2:252. Britt. & Br. Ill. Fl. 1:297. Bailey, Bot. Gaz. 9:122; Mem. Torr. Club, 1:59. **C. rostrata utriculata** Bailey, Proc. Am. Acad. 22:67.

Stoloniferous; culms stout, scabrid, 5-10 dm. tall; leaves flat, 5-8 mm. wide, nodulose, scabrid, exceeding the culms; bracts similar, the lowest exceeding the culm; staminate spikes 2-3; pistillate spikes 2-4, cylindrical, densely-flowered, $\frac{3}{8}$ cm. long, sessile, or the lowest pedunculate; scales equalling or exceeding the perigynia, lanceolate, prolonged to an acuminate scabrid tip; perigynia ovoid to ovoid-oblong, few-nerved, the body 2-3 mm. long, and the beak half as long, its teeth erect; achenes oblong.

Common in wet meadows, Bear Valley, 6,500 ft. alt., in the San Bernardino Mts.; 1275a Parish. Bluff Lake, 7,400 ft. alt.; Parish. This is the southern known limit of the species, whence it extends north through the Sierra Nevada to British Columbia; also in the Rocky Mts., and in northern Atlantic States.

C. utriculata minor Boott. l. c. Leaves narrower, and spikes slenderer and shorter.

Bear Valley, with the species; 1575 Parish.

2. **Carex comosa** Boott, Trans. Linn. Soc. 20:117. Britt. & Br. Ill. Fl. 1:301. **C. pseudocyperus comosa**, W. Boott in Wats. Bot. Cal. 2:252. Jepson, Fl. W. M. Cal. 90. **C. pseudocyperus Americana**, Hochst Herb. Unio. Itin. (1837). MacMill, Met. Minn. Val. 126. Bailey, Mem. Torr. Club, 5:89. Abrams, Fl. Los. Ang. 73.

Cæspitose; culms stout, 5-10 dm. tall, very rough on the sharp angles; leaves 6-10 mm. wide, nodulose, the upper, and the similar bracts, exceeding the culms; staminate spike 2-8 cm. long; pistillate spikes 3-5, cylindrical, 5-7 cm. long, 8-10 mm. thick, approximate, drooping on short peduncles; scales

*Continued from Page 52 (This Volume), No. 3, March, 1905.

shorter than the perigynia, ovate at base, attenuate to a rough awn; perigynia ovoid-ellipsoidal, prominently many-ribbed, stipitate, and at maturity reflexed, the body 3 mm. long, tapering into a long slender beak 1.5 mm. long, the divergent and recurved subulate teeth as long as the beak; achenes sharply triquetrous, 1.5 mm. long.

Perhaps only a waif. A single plant, growing in swamy soil, by a roadside, near San Bernardino, 1882; Parish. Reported by Davidson, in Pl. Los Ang. Co. 30, from Burbank, but there is no specimen in his herbarium. In the Atlantic States from Newfoundland to Louisiana; on the Pacific coast from Oregon to San Francisco.

✓ ++ *Perigynia hirsute*, obovoid, completely filled by the achene.

✓ 3. *Carex lanuginosa* Michx. Fl. Bor. Am. 2:175. Britt. & Br. Ill. Fl. 1:305. *C. filiformis lanuginosa* B. S. P. Prel. Cat. N. Y. 63. Bailey, Mem. Torr. Club, 5:78. *C. filiformis latifolia* Boeckl. Linnæa, 41:309. Bailey, Proc. Am. Acad. 22:74; Mem. Torr. Club, 1:64. W. Boott in Wats. Bot. Cal. 2:250. Abrams, Fl. Los Ang. 74.

Culms tufted, smooth, 5-10 dm. tall; leaves flat, rough on the edges, 3-5 cm. wide, equalling the culms; bracts similar, the lowest exceeding the culms, the upper narrow; staminate spike 3-4 cm. long, often with 1-2 short spikes at base; pistillate spikes 2-5, cylindrical, 1-3 cm. long, 7-8 mm. thick, sessile, or the lowest remote on a short peduncle; scales longer than the perigynia, glabrous, narrowed to a rough awn; perigynia fuscous, the body 3 mm. long, shortly stipitate at base, tapering into a beak 1 mm. long, the teeth glabrous, erect, 0.5 mm. long; achenes olivaceous, smooth.

Borders of swamps in the Cismontane region, below 3,000 ft. alt.; apparently rare. San Bernardino Valley, and Edgar Canyon, in the San Bernardino Mts.; Parish. A widely distributed species, from the British Possessions to the Mexican border.

A sedge collected in 1891, by Davidson, at Los Angeles, has excurrent from the emarginate apex as a short cusp, shorter than the perigynia, which are broader, and shorter beaked. Probably distinct, but further material is needed.

✓ 4. *Carex Yosemiteana* Bailey, Mem. Torr. Club, 1. 8. *C. Sartwelliana*, W. Boott. in Wats. Bot. Cal. 2:249.

Cespitose; culms rather slender, 3-angled, slightly scabrid above, 8-10 dm. tall; leaves hirsute, 5-6 mm. wide, shorter than the culms; bracts slender, the lowest exceeding the culm; staminate spike 5-6 cm. long; pistillate spikes 2-4, cylindrical, sessile, 2-3 cm. long, 5 mm. thick; scales brown with green midvein, hispid, acute, or the lower prolonged to a rough awn, as broad as the perigynia, and equalling or exceeding them;

perigynia ovoid, acute at base, the body 2 mm. long, gradually narrowed into a beak 1 mm. long, the teeth short and erect; achenes pale brown, granulate-roughened.

On a dry slope, Strawberry Valley, 6,000 ft. alt., San Jacinto Mts.; Parish. San Jacinto Mts.; Davidson. Reported otherwise only from the high mountains of Mariposa Co., where it was collected long ago by Bolander and Brewer, and in recent years by Congdon; but probably occurring at intermediate points.

5. *Carex spissa*, Bailey, Proc. Am. Acad. 22:70.

Culms stout, 10-15 dm. tall, sharply angled, smooth; leaves carinate, 1-2 cm. wide, scabrid on the margins and on the prominent ribs, about equalling the culms; lowest bract leafy, very long, the uppermost short and aristate from a scarious margined base; staminate spikes slender, 5-10 cm. long; pistillate spikes, 3-6, densely flowered, evenly cylindrical, subsquarrose, the lowest 10-15 cm. long, remote, sometimes on a peduncle up to 25 cm. long, the uppermost sessile, or nearly so, 3-6 cm. long; scales exceeding the perigynia, narrow, purple margined, prolonged in a slender toothed tip, perigynia minutely purple-dotted, obovoid, attenuate to the base, subcompressed, plano-convex in section, the body 3 mm. long, the teeth less than 1 mm.; achenes brown minutely papillose, oblong-obovoid, 3-angled, stipitate and mucronulate, not filling the perigynia.

Growing in robust clumps on the banks of streams in the Coastal subregion below 500 ft. alt. Glendale; Hasse. Los Angeles; Davidson. Pasadena; Grant. San Juan Capistrano; Nevin. San Luis Rey; Poway; Parish. Ramona; Lakeside; Brandegee. Adjacent Lower California. Santa Maria; Brandegee. Guadalupe Canyon; Orcutt. The type was collected at San Diego, by Pringle.

6. *Carex ablata*, Bailey, Bot. Gaz. 13:82. *C. frigida* of American authors, not Allioni, Fl. Ped. 2:270.

Cespitose; culms slender, scarcely angled, striate, smooth, about 1 dm. tall; basal leaves 2-3 mm. wide, long pointed, 5-10 cm. long; culm leaves 1-2, narrow, sheathing at base, 2-3 cm. long; lower bracts similar, uppermost scarious; staminate spike slender, 8-10 mm. long, usually with a small pedunculate basal spike, both of them pistillate at base; pistillate spikes 1-3, on included peduncles, the lowest distant, ovoid-oblong, 5-10 mm. long; scales ovate, ciliate above and mucronulate, 2 mm. long; perigynia divergent, very dark brown, obovoid to obovoid-ellipsoidal, acute on the edges, 3 mm. long; stigmas 3; achenes ash-colored, obovoid, 3-angled, muriculate, shortly stipitate and prominently beaked, filling the perigynium.

Grayback Mt., on High Creek, 9,500 ft. alt., July 24, 1904; 6405 Geo. B. Grant. The species is northern, and has been collected on Mt. Hood, Oregon, Stein's Pass, Wash., and in this state on the head waters of the Sacramento river. The present station is the southern limit.

✓ 7. *Carex quadrifida cæca*, Bailey, Bot. Gaz. 21:8.

Culms slender, smooth, 3-5 dm. tall; leaves flat, 2-3 mm. wide, shorter than the culms; bracts aristate, seldom equalling the inflorescence; spikes 3-6, contiguous and sessile, or the lowest remote and pedunculate 1-2 cm. long, the uppermost usually androgenous, the others pistillate throughout; scales mostly shorter than the perigynia, lanceolate, acute or obtuse; perigynia purplish, obovoid, obscurely nerved, 2.5-3 mm. long, the bidentate beak purple; stigmas 3; achenes c-ivaceous, ovoid, muriculate, narrowed at base, 1.5 mm. long.

San Jacinto Mts. Tahquitz Valley, 8,000 ft. alt., July, 1892, (type), and Round Valley, 9,500 ft. alt., June 1903; Dr. H. E. Hasse. Also in the same mountains by Davidson. Grayback Mt. on Vivian Creek, 7,500 ft. alt., 1904, Geo. B. Grant. In other varieties the species is common at high altitudes in the central Sierra Nevada.

✓ 8. *Carex laciniata*, Boott, Ill. 4:175, t.594. W. Boott in Wats. Bot. Cal. 2:243. Bailey, Proc. Am. Acad. 22:83.

Stoloniferous; culms stout, acutely angled, scabrid, 3-10 dm. tall; leaves glaucous, stiff, carinate, equalling the culms; lowest bract equalling or exceeding the inflorescence; staminate spike 3-5 cm. long, usually with 1-2 short, sessile spikes at or near the base; pistillate spikes 3-4, sessile, or the lowest on a long peduncle, 3-10 cm. long; scales hardly equalling the perigynia, brown, narrow, the apex acute or prolonged, acicular-toothed; perigynia ferrugineous, orbicular to obovoid, nerved on the outer face, the beak, and usually the upper margin, acicular-toothed, contracted at base, 3 mm. long; achenes palid, orbicular, obtuse, papillose.

Canyons of the foothills, in the Cismontane region, below 2,000 ft. alt., San Antonio River; 529 Brewer. Glendale; Hasse. Pasadena; 799 Braunton. Waterman Canyon, near San Bernardino; 2185 Parish. North to Southern Oregon.

The basal sheaths are described as fibrillose-margined, but the character does not appear in any of the numerous specimens examined.

Plate XX, Fig. 1.

✓ 9. *Carex Nebraskensis prævia*, Bailey, Mem. Torr. Club, 1:49. C. Jamesii, Torr. Monog. Cyp. 398. W. Boott in Wats. Bot. Cal. 2:243, in part.

Stoloniferous; culms erect, rough on the acute edges, 3-5

dm. tall; leaves flat, 4-5 mm. wide, shorter than the culms; staminate spikes 1-3, contiguous, the lower sessile; pistillate spikes 2-3, on short peduncles, 2-3 cm. long, 5 mm. thick; scales shorter than the perigynia, lanceolate, acute or mucronulate; perigynia ovoid or obovoid, nerved; achenes ovoid.

Bear Valley, 7,000 ft. alt., in the San Bernardino Mts.; 1578, 3280 Parish. Other immature specimens from the higher mountains, probably belong here.

5. *SCIRPUS*, Linn. *S. Pl.* 47—*Bulrush*.

Annual or perennial herbs with leafy culms, or the leaves reduced to basal sheaths. Spikelets terete, or obscurely flattened, solitary capitate, spikate or umbellate, the florescence subtended by a 1-several leaved involucre, or non-involucrate. Scales spirally imbricated all around, usually all fertile, or 1-3 lower ones empty. Perianth of 1-6 bristles, or in some species none; stamens, 2-3; style 2-3-cleft, not enlarged at the base, wholly deciduous, or the base persistent as a subulate tip to the achene. Achene 3-angled, lenticular, or plano-convex.

A genus of some 200 widely distributed species.

KEY TO THE SPECIES.

Spikelet solitary.

Involucre wanting.

Annual; 2-5 cm. tall.....1. *S. nanus*

Perennial; 10-15 cm. tall. 2. *S. pauciflor*

Involucral leaf promptly deciduous.....3. *S. cernuus*

Spikelets normally more than one; involucre persistent.

Culms 3-angled.

Principal involucral leaf pungent.

Leaves 2-6, long and narrow.....4. *S. Americanus*

Leaves 0-2, short and broad.....5. *S. Olneyi*

Involucral leaves all foliaceous.

Spikelets large, few, in a short-rayed umbel... 6. *S. Pacificus*

Spikelets small, many, in a decompound umbel.....

.....7. *S. microcarpus*

Culms, terete, sheathed at base, tall.

Umbel of a few short rays; bristles barbed.8. *S. lacustris*

Umbel decompound, long-rayed; bristles plumose....

.....9. *S. Tatora*

**Spikelet solitary, terminal; stamens 3; style 3-clet; achenes 3-angled; culms low, tufted.*

1. *Scirpus nanus*, Spreng. Pug. 1:4. Britton, Trans. N. Y. Acad. 11:74. Britt. & Br. Ill. Fl. 1:262. *Eleocharis pygmaea*, Torr. Ann. N. Y. Lye. 3:315. Watson, Bot. Cal. 2:221.

Annual; culms filiform, flattened, grooved, leafless, erect, 2-5 cm. tall; spikelet ovoid-oblong, subacute, 3-8 flowered, 2-3 mm. long, bractless; scales ovate to lanceolate, 2 mm. long, pale green, the lower obtuse, the upper subacute; bristles mostly 6, retrorsely barbed, larger than the achene, or wanting; achenes obovoid, smooth and shining, 1 mm. long, acute.

Specimens, said to be "too young for positive determination," collected April 18, 1854, at Cucamonga, by Bigelow, are referred here by Torrey, in *Pac. R. Rep.* 4:152. The species is not otherwise known from our region, and perhaps does here, and is usually found about salt marshes.

- ✓ 2. **Scirpus pauciflorus**, Lightf. *Fl. Scot.* 1078. Britton, *Trans. N. Y. Acad.* 11:75. Britt. & Br. *Ill. Fl.* 1:262. **Eleocharis pauciflorus**, Link, *Hort. Berol.* 1:284. Watson, *Bot. Cal.* 2:221.

Perennial by slender rootstocks; culms slender, rigid, striate, leafless, 10-15 cm. tall; spikelets oblong, very acute, compressed, 4-8-flowered, bractless, 5 mm. long; scales dark brown, hyaline margined, lanceolate, acuminate, 3 mm. long; bristles 2-6, as long as the achene or longer, or none; achene stramineous, obovoid, pointed, obscurely reticulate, 2 mm. long.

Bear Valley, 6,500 ft. alt. in the San Bernardino Mts., June, 1894, 3265 Parish. In our specimens the bristles are wanting. The species is a northern one, occurring on the Pacific Coast in the Sierra Nevada at considerable altitudes; eastward in the Rocky Mts., Minnesota, Western New York and Canada; also in Northern Europe.

- ✓ 3. **Scirpus cernuus**, Vahl, *Enum.* 2:285. Britton, *Trans. N. Y. Acad.* 11:76. **S. riparius**, Spreng. *Syst.* 1:208. Watson, *Bot. Cal.* 2:217.

Annual; culms tufted, setaceous or filiform, erect, 3-angled, 5-15 cm. tall. the uppermost sheath usually bearing a short leaf; involueral leaf solitary, erect, setaceous from a broad scarious base, not exceeding the spikelet, very promptly deciduous; spikelet ovoid to oblong, 2-5 mm. high; scales purple with pale midvein, or pale with brown markings, concave, oval, 1 mm. in diameter; bristles none; achenes brown, granulate orbicular, the inner face flatter and broader than the others, 0.75 mm. in width and height, mucronulate.

Common along the margins of wet streams and ponds, in the Cismontane region, below 1,500 ft. alt. Santa Monica; Hasse. Los Angeles; Braunton, Davidson. San Bernardino; Parish. A species of wide distribution in Europe, Australia and South America; but in North America known only from the Pacific Coast.

****Spikelets several or many, terminal subtended by one or more involucreal leaves; bristles 16; anthers tipped with an appendage, which is hispidulous, except in No. 7; styles 2 clet; achenes plano-convex; perennials with stout, scaly horizontal rootstocks.**

±Culms 3-angled; sheaths nodulose; bristles retrorsely barbed.

++Involucral leaf stiff and erect, apparently continuous with the culm; scales obtuse or emarginate, the stout midvein terminating in a short mucro; spikelets in a sessile cluster,

4. **Scirpus Americanus**, Pers. Syn. 1:68. Britton, Trans. N. Y. Acad. 11:78. Britt. & Br. Ill. Fl. 1:265. **S. pungens**, Vahl, Enum. 2:255. Watson, Bot. Cal. 2:218. **C. triangularis**, Mac-Mill. Met. Minn. Vol. 99.

Culms 1-5 dm. tall; leaves 2-6, at length divergent, rigid, channeled, 1-3 dm. long, 1-3 mm. wide; involucreal leaf, 2-20 cm. long, channeled; spikelets 1-4, ovoid to ovoid-oblong, acute, 5-10 mm. long; scales dark brown, ovate-oblong, 3-4 mm. long; stamens 3, appendages conical; achenes brown, obovoid, 1 mm. long, mucronate, equaled by the bristles.

Apparently confined in the Cismontane region to the coastal subregion. Los Angeles River; Davidson. San Diego; Chandler. Wet sand banks, San Pasqual; 1565 Parish. Also reported in the Botany of the Death Valley Expedition as abundant in marshes of the deserts of Inyo County. Throughout North America, and in Chile.

5. **Scirpus Olneyi**, Gray, Bost. Jour. Nat. Hist. 5:238.

Culms more or less deeply triquetrous, 3-20 dm. tall, 2-3 cm. wide; 1-2 of the sheaths usually bearing a thin, broad leaf, 2-5 cm. long, or leafless; involucreal leaf, 3-angled, 1-2 cm. long; spikelets 2-20, oblong-ovoid acute, about 1 cm. long; scales brown, broadly ovate; stamens 2-3; achenes brown, obovate, mucronate, 2 mm. long, equaled by the bristles.

Very common in marshes of the Cismontane region; occurring also in the Desert region. Los Angeles; Davidson, Nevin. Temecula; Nevin, Parish. San Bernardino; Parish Salt Creek and Palmetto Springs, Colorado Desert; Alderson, North to Oregon; on the Atlantic Coast from Florida to Rhode Island.

6. **Scirpus Pacificus**, n. sp., Britton, in lit. **S. maritimus**, Wats., Bot. Cal. 2:218. **S. robustus**, Jepson, Fl. W. Mid. Cal. 87. Abrams, Fl. Los Angeles", 69.

Culms scabrid above, 3-6 dm. tall; leaves rough-margined, 3-10 mm. wide, the longest equaling the culms; involucreal leaves 2-5, one of them erect, and 10-15 cm. long; spikelets ovoid, obtuse, 10-15 mm. long, 3-6 mm. thick; scales brown, puberulous, ovate, 5-7 mm. long, the mid-vein excurrent from the toothed apex as a short, recurved awn; bristles 1-5, weak,

shorter than the achene; stamens 3, the anthers tipped with a subulate appendage; achenes brown, obovoid; cuneate-narrowed to the base, mucronulate, 3 mm. long.

Common in brackish water near the seacoast. Long Beach; Davidson, Parish. Redondo; Grant. Los Angeles; Braunton, Nevin. Coyote Creek; Parish. Also at Camp Cady, in the Mojave Desert; Parish. Apparently not occurring in the Interior subregion. Northward along the Pacific coast to Washington. **S. robustus compactus**, Davy in Jepson, l. c., is simply the condensed form.

(To be continued.)

INDEX

Academy Publications	21
Ants from Catalina Island	60
Bees of Southern California	13, 28, 99
Butterflies of Southern California	42
<i>Cereus giganteus</i>	122
Clifton, Arizona, Flora of.....	19, 35, 130
<i>Corbula Luteola</i> , New Variety	118
Cyperaceæ of Southern California.....	8, 51, 66, 80, 106, 126
Cyst, Dermoid, ...	33
Fungi from Catalina Island	62
Gems and Rare Minerals of Southern California	85
Lichens of San Bernardino Mountain	123
Neurone, Metabolism of, ...	73
Publications Received	4, 24, 41, 72
Publications Reviewed	24, 41, 55
Report, Annual	96
San Jacinto Trails	63
Tooth, A Fossil, ...	79
Transactions	2, 22, 38, 54, 70, 95, 120

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Contents of Volume V.

Preliminary Synopsis of the S. California Cyperaceae.....	S. B. Parish
Memorial of Stephen Grout.....	S. B. Parish
Water and Milk Supply of Los Angeles.....	Dr. E. L. Leonard
Wheelerella.....	Geo. B. Grant
Diseases of Scale Insects.....	S. M. Woodbridge
A Butterfly New to California.....	Prof. J. J. Rivers
Contributions to the Lichen Flora of S. California.....	Dr. H. E. Hasse
A Few Words on Tumors.....	C. A. Whiting
Which Weighs Most, Chick or Egg.....	C. A. Whiting
A Revision of the Western <i>Mentzelias</i>	A. Davidson, M. D.
Flora of Clifton, A. T.....	A. Davidson, M. D.
A Visit to Rock Creek.....	A. Davidson, M. D.

Index to Volume V.

<i>Aerolasia Affinis</i>	17	<i>Cercocarpus ledifolius</i>	61
<i>Aerolasia albivaulis</i>	18	<i>Chorizanthe perfoliata</i>	60
<i>Aerolasia congesta</i>	17	<i>Collinsia callosa</i>	60
<i>Aerolasia davidsoniana</i>	17	<i>Cysopteris fragilis</i>	61
<i>Aerolasia desertorum</i>	16	Cyperaceae, preliminary synop-	
<i>Aerolasia gracilentia</i>	17	sis of	20 36 45
<i>Aerolasia integrifolia</i>	16	<i>Edimus proteus</i>	38
<i>Aerolasia micrantha</i>	15	<i>Eremiastrum bellioides</i>	61
<i>Aerolasia micranthha stricta</i> ...	15	Flora of Clifton, A. T.....	67
<i>Aerolasia montana</i>	18	Grout Stephen, memorial of....	18
<i>Aerolasia pectinata</i>	27	<i>Layia heterotricha</i>	60
<i>Aerolasia pinetorum</i>	16	Lichen flora, contributions to..	38
<i>Aerolasia viridescens</i>	17	<i>Acolium</i>	38
<i>Autodax lugubris</i>	72	<i>Ramalina</i>	39
<i>Brickellia wrightii</i>	60	<i>Arthonia</i>	41 42
<i>Carex alma</i>	22	<i>Biatora</i>	40
<i>Carex aurca</i>	36	<i>Cladonia</i>	39
<i>Carex athrostachys</i>	54	<i>Collema</i>	38
<i>Carex bernardino</i>	24	<i>Collemopsis</i>	38
<i>Carex bolanderi</i>	47	<i>Collemodium</i>	38
<i>Carex californica</i>	36	<i>Endocarpion</i>	43
<i>Carex chrysouleuca</i>	22	<i>Endococcus</i>	43
<i>Carex densa</i>	26	<i>Heterocarpion</i>	43
<i>Carex douglasii</i>	23	<i>Lecanora</i>	40
<i>Carex festiva</i>	53	<i>Lecideia</i>	41
<i>Carex hassei</i>	36	<i>Leptogium</i>	39
<i>Carex hookeriana</i>	26	<i>Ophalaria</i>	39
<i>Carex illota</i>	52	<i>Opegrapha</i>	42
<i>Carex mareida</i>	23	<i>Pannoria</i>	39
<i>Carex nervina</i>	26	<i>Psysea</i>	39
<i>Carex praeagrailis</i>	48	<i>Parmelia</i>	39
<i>Carex presli</i>	52	<i>Pertusaria</i>	40
<i>Carex siccata</i>	50	<i>Plaeodium</i>	40
<i>Carex specifica</i>	50	<i>Pyrenopsis</i>	38
<i>Carex stelluta ormantha</i>	47	<i>Thelosechistes</i>	39
<i>Carex subfusea</i>	53	<i>Usnea</i>	39
<i>Carex vitrea</i>	22	<i>Verrucaria</i>	44

LIBRARY
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BOTANICAL
GARDEN

SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

Linanthus breviculus	60	Water and Milk Supply, Los	
Melica strieta	60	Angeles	7
Mentzelia, Revision of western	13	Wheelerella circumcissa	28
Montia spathulata	61	Wheelerella dichotoma	28
Montia spathulata var viridis..	61	Which weighs most, chick or	
Ribes cereum	60	egg	59
Scale insects, diseases of.....	29	Oenothera trichocalyx	59
Sambucus callicarpa	62	Oenothera rutila	61
Syntrichopappus lemmoni	61	Phacelia humilis lobata	61
Tumors, a few words on.....	45	Pholisma aremaria	60
Visit to Rock Creek.....	60	Pyrola bracteata	60
		Quercus Kelloggi	60

BULLETIN

OF THE

Southern California Academy of Sciences

Committee on Publication:

C. A. Whiting, Sc. D., D. O. A. Davidson, C. M., M. D. Wm. H. Knight

CONTENTS

Transactions of the Academy	3
Recent Publications	4
The Water and Milk Supply of Los Angeles	7
A Revision of the Western <i>Mentzelias</i>	13
Memorial of Stephen Grout	18
Botanical Nomenclature at the Vienna Congress	19
A Preliminary Synopsis of the Southern California <i>Cyperaceae</i> (Continued)	20
<i>Wheelerella</i>	28
Diseases of Scale Insects	29

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TRANSACTIONS

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BIOLOGICAL SECTION.

MARCH 24, 1906

The meeting was held in the Histological Laboratory of the Pacific College of Osteopathy.

In the absence of the Chairman the meeting was called to order by the Secretary and Mr. Barrow was called to the chair.

The subject of Structure and Innervation of the Tongue was presented by C. A. Whiting and some twenty or more prepared specimens, clearly showing the Structure and Innervation of this organ, were displayed under microscopes.

About twenty-five members and visitors were present.

On motion the meeting adjourned.

C. A. WHITING, Secretary.

February 12, 1906.

The Biological Section of the Southern California Academy of Sciences met for its regular monthly meeting.

In the absence of the Chairman of the Section, the meeting was called to order by the Secretary and the minutes of the last meeting were read and approved.

The lecture of the evening was given by Dr. Wm. Bebb and was illustrated by numerous stereopticon views. The lecture dealt with the comparative development and pathology of teeth and included a discussion of the teeth of domestic, wild and captive animals. Among the most interesting views presented were skulls of rabbits in which the incisor teeth had undergone enormous development because of the suppression of the teeth which ordinarily opposed them.

One of the most important facts brought out in the lecture was that "Hutchinson's Teeth" is not indicative of Syphilis, but that that peculiar conformation of teeth may be produced by measles, diphtheria, scarlet fever and possibly other disorders.

The night was very stormy and only about twelve members and visitors were present.

C. A. WHITING, Secretary.

March 12, 1906.

BOOK REVIEW.

The sixth edition of the Microtometist's Vade-Mecum, by Arthur Bolles Lee, bearing the date of June, 1905, is at hand. Although not much larger than the fifth edition, it contains a considerable amount of new matter. This is due in part to a better arrangement of the text and in part to the substitution of new and improved methods for antiquated ones. Many of the chapters leave almost nothing for which one could wish. Though here and there seem to be some evidences of a lack of clearness due to a desire for condensation.

The severest criticism which one can pass upon the book is that in a number of places the reader is referred for further information upon the subject to the earlier editions. Reference to other literature may easily be justified, but it seldom happens that a reference to a previous edition of any work is justifiable.

It is perhaps not stating it too strongly to say that the work is absolutely necessary to the working histologist.

MAY 14 1906

It is published by P. Blakiston's Son & Co., 1012 Walnut street, Philadelphia, Pa.

RECENT PUBLICATIONS.

"The Butterflies of the West Coast of the United States," by William Greenwood Wright, San Francisco, the Whitaker & Ray Co., 1905; pp. 257, VII, Pl. 1-32.

California has every reason to be proud of Mr. Wright's handsome quarto. Paper and presswork are of the best style of bookmaking, while the plates present the highest attainment of the art of photographic color printing. It is not too high praise to say of them that they equal in beauty, and excel in life-like accuracy, the hand colored plates of Edward's great work on the North American butterflies.

In interest and importance the matter is worthy of this fine dress. For twenty-five years the author has been a diligent student of the Lepidoptera of western America. His field observations have been carried on from Alaska to Mexico, so that he knows intimately the life-history of almost every species that inhabits that vast territory. The work of so ripe a student, and in a field so little explored, the book is naturally full of new and valuable matter.

The first 32 pages are occupied with a discussion of the general features of butterfly life. This is succeeded by a complete list of the Butterflies of the United States, in which those of the western coast are distinguished by heavy-face type. This brings us to the main body of the work; a description of all the known species and varieties of Butterflies on the Pacific slope. These number 483, and all but 53 of them are illustrated by from one to seven figures, portraying them in their natural colors and in different aspects. The descriptions, while sufficient, are not in technical form, but may be readily understood by any one. In connection with the pictures, this should enable one quite unacquainted with entomology to identify most of the butterflies he may see. In all there are 487 of these beautiful figures. Twenty-nine new species and varieties are here first published. There are also many interesting notes on the habits, range, and other facts connected with the life-history of the various species.

The book is destined to remain as the permanent foundation stone of our knowledge of the western American butterflies.

S. B. P.

RECENT PUBLICATIONS.

"North American Species of *Agrostis*," by A. S. Hitchcock. Bull. 68, Bureau Plant Industry, U. S. Dept. Agriculture, 1905. Pp. 68. Pl. 1-37.

The territory included in this revision extends from Labrador to the Valley of Mexico. The genus is seen to be poorly represented in this vast region, only 27 species being recognized by the author. For the most part it is a genus of the north, and southward occurs chiefly at high altitudes. While the paper is no mere study in nomenclature, the author has found reason for changing the names of all the Southern California species, except *A. alba*, L., and *A. microphylla*, Tund. The Bear Valley grass which has passed as *A. æquivalvis*, Trin., is here considered to be *A. Rossæ*, Vasey, while another mountain grass, heretofore included in *A. scabra*, Willd., is here referred to *A. Scheidiana*, Trin. *A. scabra* itself, by the revival of an earlier specific name, becomes *A. hyemalis*, B. S. P. Sibthorp having previously used the name for another grass, Vasey's *A. tennis* takes the name *A. idadoensis*, Nash. *A. asperifolia*, Trin., of Abram's Flora, is included in the older *A. exarata*, Trin., as it was by Thurber, in the Botany of California. Finally, *A. Fiegeousis*, Vasey, proves identical with the previously published *A. foliosa*, Vasey,

but is here reduced to a variety, as *A. pallens foliosa*, Hitchc., and with it is included the *A. multicalmis* of some local plant lists.

S. B. P.

RECENT LITERATURE.

Monographie du Genre *Oenothera*, Par M. le Professeur Abbe H. Léveillé, Le Mans, France, Fascicle II., 1905.

It will be noticed that M. Léveillé prefers the spelling *Oenothera*, to that which we are accustomed to, the reasons having been discussed in the former fascicle. His views as to the plants to be included in this genus are diametrically opposed to those first set forth in 1835, by Spach, and recently revived by Raiman in elaborating the *Onograceae* for the *Natürlichen Pflanzen-familien*. For while these authors divide the *Senecioideae* into no less than a dozen, M. Léveillé not only keeps it whole, but adds to it *Gayophytum*, *Clarkia*, *Boisduvatra* and *Eulobus*. It were hasty to reject offhand the result of a special study, and not yet fully presented, but we very much doubt its acceptance by American botanists. We have not the space to enumerate the many changes made by the author in the rank and names of these plants so largely represented in our state. M. Léveillé's practice in the citation of authors for the new combinations made, is justly open to criticism. Invariably they are credited to authors who never made them. Thus we have an *Oenothera Gayophytum lasiosperma*, Greene. Now while Greene is responsible for a *Gayophytum lasiospermum*, he would undoubtedly repudiate the former combination. As appears to be inevitable, in European works treating of American plants, the names of places sometimes suffer such a "sea change" as to be nearly unrecognizable. Probably the same thing will occur when American botanists turn their attention to straightening out European genera. As in the previous fascicle the illustrations are in part from photographs of herbarium specimens, and in part from drawings, the latter usually the more satisfactory. There are also figures of the seeds of the several species, and many anatomical drawings. A third fascicle will complete the work.

S. B. P.

RECENT PUBLICATIONS.

The genus *Ribes* in California, Muhlenbergia. Vol. 1, No. 5.

Mr. H. H. Heller, the author of the above paper, has made a special study of the American species, and here presents the first systematic results of his work, to be followed, we understand, in due time, by a complete survey of the genus as it is represented on this continent. It is a very useful paper, inasmuch as it brings together the original descriptions of the 43 species which the author recognizes as occurring within the state limits. He is to be commended for providing a key, evidently very carefully worked out. The usefulness of papers similar to the present one, is often greatly diminished by a neglect to provide them with any apparatus whereby a specimen may be traced to its appropriate species. A key, moreover, at least to some extent, is a test of the validity of species, which, if well founded, should possess characters definite enough to permit of a lucid arrangement. Judged by this test one is disposed to suspect that on a careful revision, Mr. Heller will decrease, rather than augment, the number of his species.

S. B. P.

BOTANICAL SECTION.

This Section met at the Wilcox Building March 12. Dr. Davidson read a paper on the Revision of the Western *Mentzelias* and showed new specimens. A communication from Geo. B. Grant on a proposed new genus of the *Boraginaceae* family was read.

THEODORE PAYNE, Secretary.

PUBLICATIONS REVIEWED.

Monographie du genre *Onothera*, par M. H. Leveille. Fase. 2, LeMans, France, 1905.

M. Leveille's monograph, the second fascicle of which has just appeared, relates to a genus so abundantly represented in our region, and proposes such a radical change in the extension of its limits, and the disposition of its species, that it possesses an especial interest for California botanists. We trust, therefore, that it will not be without interest to note briefly the changes proposed in the present fascicle. Like the first, it is freely illustrated with photographs of herbarium specimens and anatomical figures, and, in addition is enriched by very satisfactory drawings of several species.

It will be noticed that the author prefers for reasons discussed in the first part the name *Onothera* to the more usual orthography. His views as to what are the limits of this genus are the very opposite of those proposed in 1835 by Spach, and more recently adopted and elaborated by Raiman in the *Natürlichen Pflanzenfamilien*. For while these authors break up the Linnean genus into no less than twelve genera, M. Leveille not only maintains it in its entirety, but reduces to it *Boisduvalia*, *Clarkia*, *Eulobus* and *Gayophytum*.

All the North American species of the last named genus, and several from Chili, are included in a single species, *O. Gayophytum*, Levl., whose geographical range extends from the State of Washington to the extremity of South America. The North American species form the "race" *Trelesiana*, under which are the "forms" *lasiosperma*, *eriosperma*, *ramosissima* and *diffusa*. *Eulobus californicus*, Wats., becomes *O. eulobus*, Levl. Under *O. brevipes*, Gray, are placed *Oe. scapoidea*, Nutt. as a variety, and *Oe. Parryi*, Wats. as a "race" and of it *Oe. heterochroma*, Wats., is regarded as a synonym. *O. tortulosa*, Levl., includes *Oe. dentata* D. C. and *Oe. strigulosa*, D. C. The common large flowered plant long known under Watson's herbarium name of *Oe. dentata grandiflora*, and recently published in Abram's *Flora of Los Angeles* as *Sphærostigma campestris Parishii*, is here called *O. tortulosa* race *helianthemiflora*, Levl., and under this *Oe. dentata cruciata*, Wats. appears as a form. *Oe. micrantha*, Hornem., is referred to *O. hirta*, Link, under which the variety *Jonesii* includes plants from Avalon and Paso Robles. *Oe. bistorta*, Nutt., and *Oe. Veitchiana*, Hook., are embraced in *O. cheiranthifolia*, Hornem., the former as variety *contorta*, Dougl., and the latter as a form. The *Oe. cheiranthifolia*, and its var. *suffrutescens*, of the Botany of California, are referred to *O. spiralis*, Hook. Finally *O. gauræflora*, T. & G., includes *Oe. Boothii*, Dougl., as a "race" and *Oe. allysoides*, H. & A., as a synonym.

To pass off-hand judgment on the conclusions reached by a student who has devoted much time and reflection to a subject is unjust; but we venture to doubt if most of our author's dispositions will find acceptance among American botanists. Less hesitation may be felt in criticising his citation of authorities for races, varieties and forms. When not credited to himself, they are assigned to authors who are in no way responsible for them. Thus we have *O. Gayophytum* form *lasiospermum*, Greene. Now Greene is the author of a *Gayophytum lasiospermum*, but unquestionably would repudiate the other combination to which his name is attached. The erroneous character of these citations would have appeared at once, had the place of publication been added to the author's name, as it should be in works of importance.

S. B. P.

The Water and Milk Supply of Los Angeles

E. L. LEONARD, B. S., M. D., CITY BACTERIOLOGIST.

The location of nearly every town of importance in Southern California was originally planned by the old mission fathers in relation to the possibility of its water supply. The most important missions were built in those districts where water was found in largest amount. At these old missions one may see, even today, evidences of a high degree of engineering skill possessed by these people in planning the ditches and reservoirs.

A reference to the map shows that the San Gabriel and Los Angeles rivers carry the water from the mountains toward the sea, and although not rising directly in the high ranges of the Sierra Madre mountains, at least a large part of the rain and snow finds its way into these two streams, through the underground washes with which the San Fernando and San Gabriel valleys are filled. The San Gabriel river is different from the Los Angeles river in that it has a perennial flow from the mountains in which it originates and is less affected by seasons of drouth.

The peculiar geological structure of the washes referred to shows they are made up of sand and gravel with the bed rock between 200 and 300 feet below the sea level. These immense subterranean filter galleries as we may speak of them, make the character of our water supply one of the most ideal as far as bacterial invasion is concerned. If it were possible to bring this water filtered through its beds of sand, gravel and alluvial debris directly into our city mains then our water supply would be most ideal in quality.

A study of the differences in the total rainfall in Southern California shows great variation, 5.28 inches one year and 38.23 the next. This necessarily affects the amount of water coming through the Los Angeles river, and causes great apprehension on the part of those whose business is in any way connected with the water supply.

It is almost incredible that torrents of water coming down ravines and canons are absorbed so quickly and disappear entirely into the gravel bed of the valley, while the river a few miles below shows no increase in volume whatever.

Under average conditions the river begins to appear about 11 miles from West Glendale. Its increase in volume is very marked and its flow is about 25 cu. ft. per second at the southern bend. At this point the first supply ditch is taken out, the water from which is used for irrigating purposes and to supply the parks of the city.

Filter galleries are now in process of construction at the head works where the surface water is tunneled into the bed of the river and filtered through sand before entering the head works. The bacterial count of the water before entering the filtration galleries shows 130 colonies per cu. cm. even in their incompleated condition.

The total consumption of water in Los Angeles is as great as that of San Francisco—34,000,000 gallons a day in summer, 18,000,000 gallons a day in winter.

The river still increases in volume up to about a mile above Tropico. At this point the main head works of the system are built, the flow is between 65 and 75 cu. ft. There is a slight increase in volume until Columbia Street is reached, where the river disappears altogether as the depth to bed rock increases.

During the five years which the city owned its water supply, the development of water has been given close attention by Superintendent Mulholland. With the idea of increasing the total supply different sets of wells have been bored and tunnels built.

The Buena Vista Street wells located in Elysian Park and pumping to supply the gravity reservoirs on Beaudry Avenue and Elysian Park, come from a 4000 foot tunnel under the river bed and supply about 3,000,000 gallons daily. The bacterial count varies from about 41 to about 150 bacteria to the cu. cm., depending on the season of the year. In summer time the count runs higher as the water is low. Two other wells located at the end of the West Jefferson Street car line supply 1,000,000 gallons per day and the bacterial count is between 80 and 100 colonies.

The largest part of the city water, however, is derived from the Los Angeles river. A trip to the head works occupies the greater part of a day and at this point the bacteriological tests average from 600 to 2380 colonies per cu. cm. Above the head works to the northeast the water is on the surface. It is in this region that the San Fernando farmers drain the river for agricultural purposes and in years past their stock was pastured on the banks of the stream. Dr. Powers has watched this portion of the river most closely and in years past has pulled carcasses of sheep, horses and mules out of the river. At the present time these conditions are greatly improved.

From the head works 12 miles northwest the city water runs in a cement conduit into the city mains. Between the head works and the Crystal Springs house, located on the other side of Griffith Park, the river again flows on the surface for a distance of several miles and enters the city mains at Crystal

Springs house. The bacterial count at this point is between 600 and 100 colonies to the cu. cm.

Various tests of the city water made from the faucets in different parts of the city shows an average of about 30 colonies to 1 c. c. The difference in the count is caused by the lack of nutrition and oxygen, and the pressure to which the water is subjected in the pipes.

It is commonly taught that any water supply containing over 500 colonies to 1 c. c. is unfit for use. You can see, however, that Los Angeles faucet water is comparatively free from bacteria. A bacterial examination of distilled water as delivered shows 190 colonies to 1 c. c., but of course weighing a matter of this kind, one must remember the kind of bacteria present is the all important consideration. It is a possibility of course that the organisms in city water are more apt to be pathogenic on account of the pollution of the San Fernando valley farmers and their stock, but in discussing the question of the transmission of typhoid fever through our water supply with Dr. Powers recently, he said in the history of the Health department he has never had reason to believe any epidemic of typhoid fever had its origin in the water supplied to the city, but rather from overflowing cesspools, cases of the disease at dairies, and the difficulty of proper sewage disposal at the beaches. About three-fourths of the cases of typhoid fever reported in Los Angeles have their origin in the country.

In making bacterial tests of water, certain general principles should be borne in mind. In the first place, the plating of the water should be done at the well, reservoir or stream to be tested. If samples are to be transported to the laboratory they should be placed on ice. Several plates should be made from portions of 1 c.c. 1-10, 4-10 and 6-10 gives one a good control test. In routine work agar is preferred to gelatine culture media, so that the growth may take place at a temperature above that of the room, 30 to 37½° C. The isolation of specific organisms from a given sample of water presents many difficulties. *B. Typhosus* has been isolated from water about once in 500,000 times according to Williams. *B. Coli* is more readily found on account of its greater endurance, and although this organism has been found in the faeces of birds and other animals besides man its presence in large numbers in a given sample of water is considered suspicious by many city bacteriologists.

The Owens river project opens up a bright future for Southern California. You are all more or less familiar with the plan to bring the waters of this fertile valley 200 miles northeast in Inyo County to Los Angeles. A clear and inter-

esting account of the plan is given in the November number of *Outwest*, to which I refer you.

The matter has been voted upon, bonds are sold and work will begin early in February on the construction of conduits and tunnels. It is estimated that the work will require at least four years to be completed. Others estimate at least ten years will be required.

— — — Milk Supply.

In 1894 the work of testing the milk for butter fats was begun by Dr. Powers in Los Angeles in the little room 6x10 in the attic of the City Hall which served as a chemical, bacteriological and milk laboratory as well as fumigator's room and detention ward for contagious cases for several years.

During 1894 to 1897 nothing systematic was accomplished on account of the lack of assistants. In 1897 the City Council allowed a milk inspector who went to the larger dairies supplying milk to the city, and made systematic tests of milk for butter fats and solids. The dairymen made strenuous objection to any "interference" with their work, and said the cattle in this country couldn't produce as rich milk as elsewhere on account of the climate and feed of Southern California.

In the early part of 1898 a standard was established for 3% fats and 12 1-2% solids. Then the long hard work began of compelling dairymen supplying milk to the city to conform to this standard. The early part of the work was done by Mr. George Hooser, whose untiring energy did much to bring about a better condition of affairs. To put one's self in the dairyman's place doesn't require very much imagination; to be held up at some dark corner between two and three o'clock in the morning, have an inspector open the cans, test each one with the lactometer, and at last to find those which had evidently been replenished from the water faucet, and take a sample and within the next day or two bring the driver before a police court judge was a common occurrence in those days. Such was the character of the work and it almost goes without saying that this particular busy milk inspector lost his job at the next election!

The work of educating these dairy owners has always been one of Dr. Powers' numerous special duties, and to his untiring zeal we owe the present fairly good condition of the milk supplied to Los Angeles. In 1905 the standard for fats was raised to 3 1-2%, solids 12 1-2%, while in reality the majority of the milk tests show 4% fats with the Babcock test.

The confidence of most of the dairymen has been won and

they realize that the ordinances in regard to standards, cleanliness, etc., are for their own interests. It is gratifying to see them come to the office for advice and counsel.

With the close of this year the first systematic bacteriological work has been done on the milk supplied, 39 dairies have been visited by the City Bacteriologist, and three sets of tests made from each dairy.

At the various city depots 12 different visits have been made and 49 different dairies tested as the milk was brought in to the depot. Tests have been made also of the milk as delivered to the consumer—46 specimens from restaurants and hotels were examined.

In July of this year the Board of Health established a bacterial standard for milk of 500,000 colonies to 1 c. c., after a careful study of the tests made. This has been conformed to by the better conducted dairies and the work has proved a stimulus to the majority of the dairymen. The long years of education by Dr. Powers, and the activity of the present Board of Health in visiting the dairy ranches have resulted in the use of more whitewash on the dirty corrals, more screens and cleaner milk houses and in some cases even in the washing of the milker's hands and cleaning of the udders of the cows than in several years.

There is perhaps no medium outside of blood serum which forms such an ideal culture material for bacteria as milk. It is estimated that milk 24 hours old contains more bacteria than sewage.

These are derived from the body of the cow, the hands of the milker, his pails and utensils, the water with which the cans are rinsed, the air and the flies. The temperature of milk results in a rapid increase of the number of germs and even under ordinarily clean surroundings the number of organisms in a given sample is necessarily large.

The udder of a cow is practically free from bacteria, but the lactiferous ducts are more or less crowded with various forms.

Prof. Russell, of the University of Wisconsin, gives the following interesting figures. Foremilk, 26,000 to 48,000; Milk after removal of foremilk, 1,000 to 4,000 colonies in 1c. c. In many of the large cities this fact is taken advantage of and certain dairies are under the immediate supervision of physicians and health boards. The cows are cleaned, milk utensils are scalded and milkers wear clean white clothing, the foremilk is discarded and the high grade product is known as "certified milk." So far Los Angeles has no concern which furnishes this class of milk, but it is believed by those who have studied the question that there is a fortune in the dairy business along this line.

Much of the milk delivered to the city through the depots is pasteurized, that is, exposed to a temperature between 65 and 70° C., by which a great number of bacteria are destroyed. Milk brought in by dairymen showing 16,000,000 bacteria to 1c. c. after pasteurization shows a count of 100,000 per cu. cm. While pasteurization might partially settle the question of clean milk it would put the small dairymen out of business and restrictions about cleanliness would be in a great measure removed. Lactic acid and other bacteria are destroyed which are necessary for the flavor in butter and cheese. During the past year the bacterial count at the dairies has conformed to the standard of 500,000 colonies per cu. cm., most of the best dairies showing from 50,000 to 300,000. The particular disadvantages for clean milk in Southern California are the dust, the warm days and transportation from the dairy to the consumer. Dairies on the electric lines have a decided advantage over those whose milk is brought to the city in wagons. The average number of bacteria in milk delivered to the consumer in Los Angeles is between 1,000,000 and 3,000,000 to one c. c. While this may seem an enormous number of germs (48,000,000 in an ordinary glass of milk) very few of this number are pathogenic. A comparative study of the bacteriological standards of other cities is of interest:

Munich, 200,000 to 6,000,000.

Wurzburg, 222,000 to 23,000,000.

Boston, 30,000 to 4,220,000.

Middletown, Conn., 11,000 to 85,500,000.

Sewage, 100,000 to 4,000,000.

The different species of bacteria found in milk are about 200. Many of these are necessary for the production of flavors in butter, cheese and in the milk itself. Among the more important contagious diseases probably transmitted by milk, are tuberculosis, diphtheria and typhoid fever.

The most important work along dairy lines of the Los Angeles Health Department for the year is the appointment of a veterinarian, Dr. L. W. Young, whose three months of work have been productive of great good. Many diseased animals have been removed from dairy herds, suffering principally from tuberculosis and actinomyces, and after all our main hope for the future must be in removing of diseased animals from dairy herds.

A Revision of the Western *Mentzelias*

BY ANSTRUTHER DAVIDSON, M. D.

The difficulties attending the determination of the *Mentzelias* of the Genus *Trachyphytum* I thought might be wholly personal, but on looking over the herbaria of the University of California, Messrs. Parish and Brandegee, I have sufficient reason for thinking that other botanists have found their investigation as unsatisfactory as I have.

When at the British Museum and at Kew Gardens last summer, I was generously aided in the examination of the specimens they possess. These had been examined by Urban and Gilg. when preparing their exhaustive monograph "*Monographia Loasacarum*." Many of the specimens were named according to their classification, and the collector's herbarium number of many of the specimens quoted is given in the monograph. The work of identification was thus rendered very easy.

In the "*Monographia Loasacarum*" the authors have left ***M. micrantha***, ***M. congesta*** and ***M. aurea*** as we understand them, but all the others are grouped as varieties of ***M. albicaulis*** Dougl.

Five varieties are given:

Var. a—**Genuina** Urban et Gilg. is our ***M. integrifolia*** Wats.

Var. b—**Veitchiana** Urb. et Gilg. is ***M. veitchiana*** Kell and ***M. affinis*** Greene.

Var. c—**Gracilentia** Wats. is ***M. gracilentia*** T. & G.

Var. d—**Jonesii** Urb. et Gilg. New species from Yucca, Ariz.

Var. e—**Pectinata** Urb. et Gilg. is ***M. pectinata*** Kell.

To me this is no solution of our difficulties and while it may, like some of the new religions, be very broad and accomodating, it is not exactly what is desired for scientific work. In some instances there is lack of consistency in their labelling. ***Acrolasia pinetorum***, Heller, is in one place classed as ***genuina***, and in another as ***veitchiana***. ***A. pinetorum***, Heller is a very definite species and bears no very close affinity to any other.

Elmer 3657, Acton, Los Angeles, labelled ***M. congesta***, is obviously ***Acrolasia davidsoni***, Abrams. The latter species is so distinct from the typical ***congesta***, and its geographical range is so different that one cannot very well understand its being overlooked.

These differences of opinion may be but another proof of the difficulties attendant on any attempt to rigidly classify this genus. Whether my attempt to make more easy the segregation of the species is successful, time alone will tell. It has at least resulted in a better understanding of the distribution of the recognized species.

In the herbaria examined there was but one specimen of **Acrolasia pectinata** and none of **A. nitens**, Greene. I have in consequence omitted all reference to those two though I think that they may be valid species. I have supposed **A. dispersa**, Wats. and **A. integrifolia**, Wats., to be the same species.

The species of the genus *Trachyphytum* may be classified according to their vegetative characters in the following order: **A. aurea**; **gracilentia**; **affinis**; **viridescens**; **albicaulis**; **congesta**; **davidsoni**; **desertorum**; **dispersa**; **pinetorum**; **montana**; but for study purposes the most accurate method is that adopted by Dr. Greene in the "Flora Franciscana." The shape of the seeds is here the key to the grouping. The specimens examined would seem to indicate that the shape of the seeds in the different species is fairly constant, and this with the other specific characters help to definitely determine the rank of each.

In one important particular I must differ from all authors. **A. gracilentia** is invariably described as having seeds in three rows. In this district the plant is fairly common. I have examined large numbers of them in the fresh state and have invariably found only one row to exist. So far as I can determine the herbaria specimens from elsewhere show but one row of seeds.

There are but few exceptions to "seeds in a single row" in this genus; these will be specified later.

The seeds of **A. gracilentia** may be taken as a type of which all the species showing the prismatic form of seed are more or less a variation. Those of **gracilentia** viewed from above are triangular prisms as broad as deep, grooved on the angles, the upper surface depressed below the edges. Perfectly symmetrical seeds of this shape are only to be found towards the centre of the capsule, those near the ends being all more or less distorted. In **integrifolia** the seeds are deeper and more oblique at the ends. In some of the others the grooves widen out so as to form irregularly sided seeds, but the general tendency is to conform to this prismatic type even in those species of the **albicaulis** group where the seeds are irregular and very seldom show any grooves on the angles. The width of the groove varies in different species but this is too slight a feature to be a means of identification. Reference to the tubercles on the seeds I have omitted as all show it more or less under the microscope, so that it is difficult to say when they may be considered smooth. **Pinetorum** comes nearest to being smooth.

K E Y

Seeds prismatical with grooved angles.

Petals 2 lines long or less.

Floral leaves concealing flowers.....**A. micrantha**

Floral leaves not concealing flowers.

Calyx lobes $\frac{1}{2}$ line long.....**A. pinetorum**

Calyx lobes more than $\frac{1}{2}$ line long.

Leaves mostly entire.....**A. integrifolia**

Leaves somewhat cinereous.....**A. desertorum**

Leaves light green, hairs on capsule pustulate at base
A. viridescens

Petals 4 lines long or more.

Petals about 4 lines, capsular hairs with pustulate base

A. affinis

Petals about 6 lines long, capsular hairs not pustulate at base

A. gracilentia

Seeds irregularly angled, only occasionally grooved.

Petals 1 inch long or more.....**A. aurea**

Petals small.

Floral leaves almost concealing the capsule.

Leaves pinnate partite or much divided...**A. congesta**

Leaves mostly entire, bracts larger...**A. davidsoniana**

Floral leaves not concealing capsule.

Capsule over 6 lines long, floral leaves much shorter

A. albicaulis

Capsule 6 lines long or less, one of the floral leaves

as long as the capsule.....**A. montana**



Acrolasia micrantha, (T. & G.) Rybd.

Rather rare. The specimens from Catalina and Guadalupe are more decumbent and foliaceous than those of the interior. It may be found in nearly all the canyons of the Santa Monica mountains, and is probably more common there than anywhere else in the county. The plants from the interior are more strict and stouter of habit; notably those from Canyon Diablo,

Davy 245, Saratoga, Santa Clara Co.: Davidson, Catalina Is. and Santa Monica Mts.: Hall 1219, Temecula Canyon, Riverside Co.: Brandegee July 1888, Little Sur, San Diego Co.: Orcutt, June 4, '83, Tia Juana.: Anthony 259, Guadalupe: Parish June 1893, Canyon Diablo.



A. micrantha stricta. n. var.

Annual, 8 in. high, upright and stiff in habit, cauline leaves $1\frac{1}{2}$ in. long, 3 lines broad, diminishing upwards, regularly sinuate toothed or serrate; floral bracts broadly ovate, entire or remotely toothed as in type; flowers, capsule and seed as in type. The strict habit of growth and the symmetrically toothed leaves separate it from the type. F. W. Hubby No. 67, Ap. 6, 1896, Ojai, Santa Barbara Co.; E. L. Greene, June 24, 1892, Mt. Diablo, Cal. The former in the University of California the type.

A. pinetorum, Heller.

A well defined species widely distributed in California, ranging from Plumas County to San Diego and apparently limited to the mountains of over 5000 ft. alt. Seeds in one row; the perfect ones grooved on all the angles; in shape they are miniatures of **gracilentia**. Though somewhat resembling **dispersa**, the very short calyx lobes and long attenuate capsule readily distinguish it from any other species. It has been hitherto confused with **dispersa** and all the herbaria specimens examined have borne the latter name. I listed it as "dispersa" in my county list. Abrams in Flora Los Angeles Co., names it "affinis."

C. A. Purpus, Potter Valley, Mendocino Co.; Heller 7503, Alma Soda Springs, Santa Clara Co.: Congdon 185, Mariposa: Hall & Babcock 4418, Warner Creek, Plumas Co., 4800 ft. alt.: Hall & Chandler 269, Pine Edge, Fresno Co., 3500 ft. alt.: Davidson, Wilson Peak, Los Angeles Co., 6000 ft. alt. Hall 2272, Strawberry Valley, Riverside Co., 5200 ft. alt.: Hall 1228, Lytle Creek, San Bernardino Co., 5700 ft. alt.: Brandegee June 20, 1904, Laguna Mts., San Diego: Purpus 5102, Pah Ute, 7 to 8000 ft. alt.

A. integrifolia, (Wats.) Rydb.

In the collections examined this species is not represented from California. Heller 3147, Lewiston, Idaho: Brandegee July, 1897, Teton Forrest, Wyoming: Baker 1345, Douglas Co., Nevada: Crandall, Lorimer Co., Col: Baker 203, Black Canyon, Col.: Heller 6865, Donner Lake: Brandegee 791, Washington.

A. desertorum, n sp.

Annual, 4 to 6 in. high, branching from base; basal leaves narrowly lanceolate $1\frac{1}{2}$ to 2 in. long, 1 to 2 lines wide, tapering to a long petiole like base, pinnatifid or deeply toothed, stem leaves broader, sessile, ovate lanceolate, floral bracts ovate-lanceolate, 1 to 2 lines broad, the longest half the length of the capsule; calyx lobes 1 line long, flowers slightly longer; capsule 6 to 9 lines long, narrow linear-clavate; seeds in one row, grooved on angles. The whole plant greyish with close-set, short stiff hairs.

The Arizona species distributed as **albicaulis** probably includes this species, which differs materially from **albicaulis** in floral characters and seeds. It however does not agree with the specimens I gathered at Lordsburg, N. M., but the material I possess is too scanty to pass judgment upon. Brandegee, March 30, 1901, Signal Mt., Colordao Desert near boundary line: Hall No. 2788, April, 1902, Coyote Canyon, 500 ft. alt., western border of the Colorado Desert, Cal. The former is the type.

A. viridescens, Heller.

✓
Mr. Heller kindly sent me a specimen of this. While the light green color of the plant, and the small flower seem distinctive enough, yet the hairs on the capsule show slightly pustulate at base, and the shape of the leaves are rather suggestive of **affinis**. Halls No. 6073, from Sheep Hole Mts., Mohave Desert, San Bernardino Co., is probably this same species, though the capsule is more hirsute, and the flowers larger. It may prove to be but a variety of **affinis**.

A. affinis, (Greene) Rydb.

A species of the interior plains extending to Tucson, Ariz. The specimens distributed by Mr. Toumey as **albicaulis** are evidently not that species and may be tentatively placed here. Brandegee July, 1887, Sissons: Davy 1742, Bakersfield: Baker 2781, Tracy, San Joaquin Co.: Mitchener & Bioletti, April 10, 1892, Byron, Contra Costa Co.: Parish 4165, San Bernardino Co., and 1873, Arrowhead, San Bernardino Co.: Hall 3829, Riverside, and 3236, Simi, Ventura Co.: Toumey 163, Tucson, and April 8, 1894, Tucson.

A. gracilentia, (T. & G.) Rydb.

This species is not uncommon around Los Angeles and is properly a coast plant.

Brewer, May 7, 1861, San Antonio Creek, Monterey Co.; Barber, Paso Robles, San Luis Obispo Co.; Summers 350, Santa Lucia Mts.; Hall 1378, Swartout Canyon and 6217, Cajon Pass, San Bernardino Co.; Hall 6002, Cotton Wood Pass, and San Jacinto Lake, Riverside Co.: McClatchie 71, Elsinore: Orcutt, June 27, 1884, Point Loma.

A. pectinata, (Kell) Rydb.

Davy 2176, Tehachapi, Los Angeles Co.

A. congesta, (Nutt.) Rydb.

Parish 1976, Mohave Desert: is the only specimen seen from west of the Rockies.

A. davidsoniana, Abrams.

Probably limited to the high mountains west of the Rockies. Its altitudinal range and general distribution in California is apparently the same as **pinetorum**. On Wilson Peak, Los Angeles Co., both are found close together among the pines. The seeds are in three rows in the capsule.

Schockley 304, Miller Mt., Nevada, 7000 ft. alt.; Congdon, Aug. 19, 1894, Ease of Minarets, Mariposa Co.; Hall and Chandler, Byron, Eldorado Co., 6300 ft. alt.; Hall and Babcock 5203, Bonita Meadow, Tulare Co., 8500 ft. alt.; Hall 2225, San Jacinto Mt., 5200 ft. alt.;

Parish, June, 1895, Cushenberry Canyon, Riverside Co.: Brandegee, June 23, '93, Honey Lake, Cal.: Purpus 5286, Pah Ute, Cal.

A. albicaulis, (Dougl.) Rydb.

A species of the Rocky Mountain region, occasionally represented westwards, as at Bear Valley, Fort Tejon (Greene), and Providence Mts., Lower California.

Brandegee, May, 1875, Canyon City, Col.; Cowen, May, 1892, Lorimer Co., Col.; Gooding 932, Meadow Valley, Nevada; Drew, July 20, 1889, Bloody Canyon, Mono Co.; Parish 3314, Bear Valley, 6500 ft. alt.; Brandegee, May 26, 1902, Providence Mts.; Orcutt, July 5, 1884, Cantillas Mts., Lower California.

A. montana, n. sp.

Annual; 12 to 15 in. high, upright, slender stems, very white and quite smooth to the eye, sparse hairs show under microscope: basal leaves 2 to 3 in. long, 4 to 6 lines wide, pinnatifid or roughly toothed or coarsely serrate; cauline leaves, 1 to 1½ in. long, 2 lines wide in the middle, broader below and toothed on each side, narrowed at base sessile; petals 2 to 3 lines long, yellow, calyx lobes 1½ lines long; floral bracts 3, all lanceolate-ovate, entire, occasionally toothed near base and broader, the longest 1 line wide, equalling the capsule, the other two successively shorter; capsule clavate ½ in. long or less, 1 to 1½ lines broad; leaves and capsule pubescent with soft, rather long hairs; seeds in three rows, brown, irregular, only an occasional one grooved.

In vegetative appearance it most closely resembles *pinetorum*, but the short capsule, and long floral bract readily differentiate it from any other species. The type is No. 6511. H. M. Hall, Mt. Pinos, Ventura Co., 6000 ft. alt., in author's herbarium.

Memorial of Stephen Grout.

Mr. Stephen Grout died at Riverside, Cal., on the fourth day of February, 1906. He had attained to a ripe age, having been born October 28, 1823. His birthplace was Stratton, Vermont, and it was in that state that the most of his life was past. He was educated at the Academy at Manchester, and in 1857 became a resident of East Dorset. Here he married Miss Henrietta A. Fuller, and here he continued to reside until the close of the year 1899, taking a large share in all the activities of the place, both civic and religious. In that year, his health failing, he sought the milder climate of California, and after a year's residence in Los Angeles, he removed, in January, 1901, to Riverside.

East Dorset, where so great a part of Mr. Grout's life was spent, is situated in one of the southern valleys of the Green Mountains, a region rich in a varied flora. From a boy he had felt an interest in plants, and a desire to learn something about them, and at East Dorset he began the study of botany, a study in which he enjoyed the companionship of his wife. Later, in 1894, he began his collection of the plants of that region, which he afterwards continued to enlarge, as opportunity served. He was one of the founders of the Vermont Botanical Club, of which he continued an active member so long as he resided in that state. While in Los Angeles he became a member of the Southern California Academy of Sciences, and on his removal to Riverside was one of the little company of botanists who organized the Botanical Club of that place. In this society he took great interest, and was its president until his death.

With advancing years his love of plants rather increased than diminished, and although after his removal to California his activity was much restricted, he found an unfailing interest in the novel flora about him, and lost no opportunity of adding to his knowledge of it. The feebleness of his years was of the body only, and had not sapped the vigor of his mind. He was fortunate in retaining to the last a fresh interest, not only in his studies, but in all the great movements and events of our times. His disposition was modest and retiring, and a transparent simplicity, and sincerity were marked traits of his character. His gentle and unaffected kindness are a pleasant memory to all who knew him.

S. B. P.

Botanical Nomenclature at the Vienna Congress.

No subject received more careful consideration at the International Botanical Congress, which met in June last in Vienna, than that of botanical nomenclature. The conclusions reached by a representative body of this high character are of importance to botanists everywhere, and especially to us here in America, where nomenclature has tended, of late years, to fall into lamentable confusion.

Two rules were adopted without dissent. The first establishes 1753, the year in which Linnaeus published his "*Species Plantarum*," as the initial date for both genera and species. The second provides for uniformity in the terminations of the names of orders, families, etc. Thus, *Carduaceae* should take the place of *Compositae*, and *Brassicaceae* of *Cruciferae*.

The remaining laws, while failing to command unanimity, were adopted by large majorities. They provide that the adjective name shall be preserved when a species is transferred

from one genus to another, but a varietal adjective is not necessarily to be retained when a plant is raised in rank. Duplicate names, such as "Sassafras, sassafras," are not to be permitted, and the famous dictum, "once a synonym always a synonym," is rejected.

It will be seen that the Congress decisively rejected the peculiar rules accepted and so zealously applied by a very respectable body of American botanists. It seems to have been of the opinion that stability was not obtainable by sacrificing practical convenience to a pedantic construction of the rule of priority. Surely if it is to be achieved at all, it must be by conformity to the decisions of the international authority. The choice lies between conformity and provincialism. S. B. P.

A Preliminary Synopsis of the Southern California Cyperaceæ. XI.

BY S. B. PARISH

(Continued from page 133, Vol. 4)

Subgenus II **Vignea**, Koch, Syl. Fl. Germ. 784.

Spikes sessile, more or less aggregated in heads, panicle, or rarely solitary. Staminate flowers few, borne at the summit or at the base of the spikes, or rarely intermingled with the pistillate flowers, or spikes unisexual, or the plants dioecious. Perigynia plano-convex in cross section. Stigmas always 2. Achenes plano-convex or lenticular.*

*I take this opportunity to acknowledge the kind assistance of Dr. Theodore Holm, in the determination of some difficult specimens of this subgenus, and also my indebtedness to Mrs. Charlotte M. Wilder for the drawings from which Plates 20 and 23 were reproduced.

KEY TO VIGNEA.

A. Staminate flowers at the summit of the spikes.

Heads elongated, interrupted below, paniculately decomposed.

Perigynia firm, margined to the base. 20. **C. chrysoleuca**

Perigynia spongiose at base, margined above.

Perigynia nerveless 21. **C. alma**

Perigynia nerved on the outer face. 22. **C. vitrea**

Heads ovoid to ovoid-oblong.

Spikes greenish, the lower compound; rhizomes brown.

23. **C. Douglasii**

terminal cone; scales chaffy, and at maturity loose and spreading; bracts short and inconspicuous, awnlike from an expanded chaffy base; culms leafy; rhizomes light in color.

+*Staminate column conspicuous; heads brownish.*

20. **Carex chrysoleuca**, Holm, Am. Jour. Sci. 17:302, f. 3. 4.

Culms slender, but stiff and erect, 3-angled, roughish above, 4-5 dm. tall; leaves carinate, 3-4 mm. wide, shorter than the culms; heads 3-6 cm. long, 5-10 mm. thick; spikes ovoid; scales exceeding the perigynia, the linear midvein excurrent as a short, rough awn; perigynia light brown, firm, distinctly nerved on the outer face, broadly ovoid, serrate above, abruptly contracted to a narrow, deeply-split beak, shortly stipitate, 3 mm. long; achenes light brown, lenticular, broadly ovoid, punctate, filling the body of the perigynia.

Volcan Mt., San Diego Co., June 20, 1881; D. Cleveland. Coldwater Cañon, San Antonio Mt., Los Angeles Co., July, 1902; 2679 Abrams. The type was collected in Mariposa Co., by Congdon.

++*Staminate column less evident; heads stramineous.*

21. **Carex alma**, Bailey, Mem. Torr. Club, 1:50.

Culms stoutish, rough above on the sharp angles, 4-12 dm. tall; leaves carinate, 3-5 mm. wide, mostly exceeding the culms; heads 9-12 cm. long, 10-15 mm. thick; spikes ovoid, in ovoid clusters; scales equalling the perigynia, oval to oval-oblong, acute, or with the linear midvein excurrent; perigynia brown, shining, nerveless, ovoid, narrowed to a long, bidentate beak, serrate on the sharp upper margins, thick and spongy at the mostly truncate base, 3.5-4 mm. long; achenes brown, punctate, lenticular, oblong 1.75-2 mm. long.

Growing in robust clumps along streams in the mountains of the Cismontane region, and ascending the Nevadan range to 7,500 ft. alt., Mt. Pinos, Ventura Co.; Middle Fork, 5,800 ft. alt., June, and Bitter Creek, 7,800 ft. alt., July, 1905; 6479, 6570 Hall. Near Santa Ana; Helen D. Geis. Pasadena; McClatchie. San Antonio Cañon, 5,500 ft. alt., Aug., 1893; Hasse. San Bernardino Mts.; Vivian Creek, 7,500 ft. alt., July, 1904; 6399 Geo. B. Grant. Bear Valley, 6,500 ft. alt., Aug., 1882, and City Creek, 3,000 ft. alt.; 1611, 2223 Parish. The type was 396 Parry & Lemmon, from San Bernardino Co. Some specimens have been referred to **C. teretiuscula**, Good., a species which probably does not occur here. When not entirely mature the perigynia are whitish, and 3-nerved on the back, but when fully mature are smooth and brown.

✓ 22. **Carex vitrea**, Holm, Am. Jour. Sci. 17:303, f. 5, 7.

Culms slender, rough on the edge, 6-7 dm. tall; leaves flat, 3-4 mm. wide, longer than the culms; spikes in oblong clusters, 1-2 cm. long, the lowest often on a short stalk; heads 8-10 cm. long, manifestly paniculate; scales shorter than the perigynia, ovate-acuminate; perigynia brown, ovoid-lanceolate, few nerved on the outer face, the narrow in-curved margins serrate above, spongy at the rounded, stipitate base, 3 mm. long, the beak half the length of the body; achenes ovoid, lenticular, 1.5 mm. long.

Growing in robust tussocks on the margins of streams, on the desert side of the San Jacinto and San Bernardino Mts. West Cañon, Palm Springs, 500 ft. alt., April, 1882, 1896; 1572, 4144 Parish, the latter the type. Cactus Flat, head of Cushenberry Cañon, 4,500 ft. alt., May, 1882, June, 1895; 1773 B, 3724 Parish. The only *Carex* of the desert borders.

***Spikes aggregated in ovoid or oblong heads; some spikes unisexual, or the plants dioecious; rhizomes scaly, creeping.*

+Heads dense, greenish brown, ovoid usually nearly as wide as long; upper spikes simple, the lower compound; stigmas long; rhizomes brown; plants mostly dioecious.

✓ 23. **Carex Douglasii**, Boott in Hook. Fl. Bor. Am. 213, t. 214 W. Boott in Wats. Bot. Cal. 2:231. Bailey, Proc. Am. Acad. 22:138.

Culms smooth, 4-30 cm. tall; leaves 1 mm. wide, tapering to a long, slender point, exceeding the culms; bracts scarious, broad and clasping at base, the strong green midvein mostly prolonged as a smooth awn; heads 2-4 cm. long; spikes oblong, up to 1 cm. long; scales longer than the perigynia, pallid, narrowly lanceolate, acute or cuspidate; perigynia castaneous. ovoid, strongly convex, wing-margined, 4 mm. long, the serrate, bidentate beak one-third the length of the body; achenes castaneous, orbicular, 1.5-2 mm. long.

Summit of Mt. Pinos, Ventura Co., 8,800 ft. alt., July, 1905; 4554 Hall. A species of high altitudes, extending north to Oregon, and east to Wyoming and New Mexico.

+Heads brown, ovoid to narrowly oblong, usually longer than wide; rhizomes black.

✓ 24. **Carex marcida**, Boott in Hook. Fl. Bor. Am. 212, t. 213.

Culms, slender, roughish, 1.5-3 dm. tall; leaves 2 mm. wide, shorter than the culms; heads 1-1.5 cm. long, 5-7 mm. thick; spikes ovoid, 5 mm. long, all but the upper often wholly pistillate; bracts inconspicuous, scale-like, rough awned; scales as long as the perigynia, ovate, acute or cuspidate; perigynia dark brown, ovoid, serrate above, sharp on the margins, 3 mm. long.

attenuate to a beak half as long as the body; achenes pallid, ovoid, 1.5 mm. long.

Apparently confined to the marshes near the coast. Ballona, April, 1889; Hasse. Mesmer; 3239 Abrams. Santa Ana; Helen D. Geis.

According to authors this sedge is of wide distribution in western America, but probably several species may be confused under the name. I refer our own plants to it with doubt. The type was "a few specimens brought by Mr. Scouler from the Columbia river." It was described by Dr. Boott in Hooker's *Flora Borealis-Americanae*, where the perigynia are characterized as "**late ovatis acuminatatis rostratis, superne margine serratis.**" Later he redescribed it in the "Illustrations of the Genus *Carex*," broadening the characterization of the perigynia to "**suborbiculatis vel ovatis, plus minus rostratis, superne margine alatis serratis.**"

In both works the details are figured, but so unlike in the two plates, that it is difficult to believe that both were drawn from the same plant. This discrepancy is noted in the "Illustrations," but not explained. Britton and Brown, in the "Illustrated Flora," adopt Boott's later description and figures, and if these represent the true species, our plants hardly can be of it. They may be included, however, if the earlier figure be taken as the correct representation. Recent authors state that the plants are sometimes "nearly dioecious," and that some spikes are wholly staminate. These characters are not noted in either of Boott's descriptions, and do not appear in our specimens.

Plate XX, Fig. 2. Tracing from t. cexiii, Hook. Fl. Bor. Am. 1. Pistillate flower. 2, 3. Perigynia. 4. Achene. Fig. 7. Tracing from t. xlv, Boott, Ill. Gen. *Carex*. a. Perigynium, anterior face. b. Perigynium, posterior face. c. Pistil. h. Pistillate scale. i. Bract. Fig. 5, Drawn from Hasse's specimen. a. Perigynium. b. Pistil. c. Pistillate scale.

***Spikes light brown, simple, aggregated in a dense ovoid or globose head; bracts inconspicuous, aristate from an expanded scarious base.

✓ 25. *Carex Bernardina*, n. sp.

Rhizome creeping; culms slender and lax, rough on the sharp edges, 5-6 dm. tall; leaves 1-3 mm. wide, shorter than the culms; spikes in a dense ovoid head, about 2 cm. long and 1-1.5 cm. thick; scales a little shorter than the perigynia, hyaline, with a brown midvein, ovate, acute; perigynia brown, suborbicular, strongly nerved on the exterior face, the subcordate base stipitate, 2-2.5 mm. long, contracted to a serrate beak as long as the body; achenes pallid, lenticular, puncticulate, conformed to the body of the perigynium.

1911



CAREX BARNARDINA

In a meadow, San Bernardino Valley, 1,000 ft. alt., April 13, 1900; 4600 Parish.

Plate XXI. Type specimen, photographed by Mr. W. G. Wright. Plate XX. ^aa. Perigynium, inner face. b. Exterior face of the same. c. Scale.

- ✓ 26. **Carex densa**, Bailey, Mem. Torr. Club, 1:50. **C. paniculata**, W. Boott in Wats. Bot. Cal, 2:232. **C. Brongniartii densa**, Bailey, Proc. Am. Acad. 22:137.

Culms slender, scabridous above, 5-8 dm. tall; leaves 3-5 mm. wide; much shorter than the culms; spikes few in a dense ovoid or globose head, 2-5 cm. long, 1-2 cm. thick; scales about equalling the perigynia, castaneous with prominent green mid-vein, narrow, the acuminate apex rough; perigynia ovoid-acuminate, strongly nerved on both sides, serrate above on the sharp margins, 3 mm. long, prolonged into a narrow beak; achenes conformed to the body of the perigynium.

Cuyamaca Mts., July 12, 1875; 389 Palmer. This specimen, the type in part, was referred by W. Boott, in the Botany of California, 2:232, to **C. foetida**, the **C. vernaculata** of Bailey, Bull. Torr. Club, 20:417. The species extends throughout the Sierra Nevada to northern California, the above station being its southern limit.

- ✓ 27. **Carex nervina**, Bailey, Bot. Gaz. 10:203, t. 3, f. 6-8; Proc. Am. Acad. 22:184.

Culms slender, slightly roughened above, 4-5 dm. tall; leaves nearly smooth, 2 mm. wide, mostly very short; spikes 6-10, in an ovoid or globose head, 1-1.5 cm. long; scales shorter than the perigynia, brownish, oval, obtuse or acutish; perigynia brownish, lanceolate, spongy at the obtuse base, 4 mm. long, gradually narrowed to a long, rough beak; achenes olivaceous, 2 mm. long, not filling the perigynia, which thus appear thick-margined.

At high altitudes in the San Bernardino Mts. High Creek, 9,500 ft. alt., July, 1904; 6403 Geo. B. Grant. Cienega between Bear Valley and Bluff Lake, 7,000 ft. alt., Aug., 1902; 2656 Abrams. The type was collected at Summit Camp, in the central Sierra Nevada, in 1870, by Kellogg.

****Spikes light brown, discontinuous, or at the apex clustered, in a short narrow head; rhizomes creeping, scaly and brown.*

28. **Carex Hookeriana**, Olney, Silliman's Jour. Ser. I, 29:248, f. 75. Bailey, Mem. Torr. Club, 1:14. **C. muricata gracilis**, Boott, Ill. 193. W. Boott in Wats. Bot. Cal. 2:236, Bailey, Proc. Am. Acad. 22:140. Jepson, Fl. W. Mid. Cal. 92.

Culms slender, erect, scabrid, 3-5 dm. tall; leaves flat, 2-3 mm. wide, tapering to a fine point, equalling or exceeding the culms; spikes 3-5, narrowly ovoid to ellipsoidal, 3-5 mm. long; lower



Fig. 7

Fig. 2

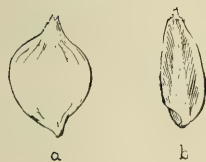


Fig 1

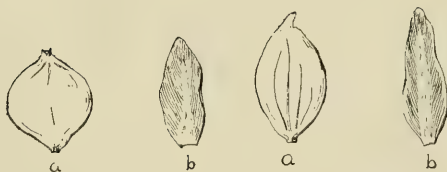


Fig 3

Fig 8



Fig 4.



Fig 6

bracts aristate from a broad scarious base, shorter, or rarely much longer than the heads; scales equalling or exceeding the perigynia, the green midvein excurrent as a short, nearly smooth awn; perigynia castaneous, ovoid, thick, nerved or nearly nerveless, produced at base, 4 mm. long, contracted to a long, serrulate beak; achenes ovoid, 2 mm. long, entirely filling the body of the perigynium.

In marshes of the Coastal subregion. Near Santa Ana, Helen D. Geis. Ostrich Farm, near Los Angeles; Hasse. Acton; Hasse.

Wheelerella

Dr. E. L. Greene writes me that **Piptocalyx** is invalid by reason of a prior genus of the same name, and also that he does not approve of the name **Greeneocharis** proposed by a European author to take its place. Therefore I propose to name the genus in memory of Walter Wheeler, a young amateur botanist of Southern California who was instantly struck dead by lightning on July 25, 1904, while botanizing on the very summit of Mt. San Gorgonio, or "Grayback," the highest peak of the San Bernardino range and about twelve thousand feet above the sea level.

Wheelerella of Borraginaceæ.

Piptocalyx Torrey.

Krynitzkia, sub section **Piptocalyx** Gray.

The genus comprises two diminutive annuals of the **Asperifoliæ** and ranges from Lower California and Arizona through the arid regions as far as British Columbia. They are from one to four inches high and are easily mistaken for *Cryptanthus*.

Wheelerella circumcissa (H. & A.)

Found sparingly in Los Angeles County mountains and throughout the given range. Seldom over two inches high, in tufts in very dry, sandy soil.

Wheelerella dichotoma (Greene).

So far reported only from Western Nevada. Very similar to the last but somewhat larger and coarser.

GEO. B. GRANT.

Pasadena, Cal.

Diseases of Scale Insects

BY S. M. WOODBRIDGE, PH. D.

There is nothing new or startling in the statement that the human race as well as other members of the animal kingdom have been subject to diseases and sometimes to epidemic diseases that have swept them off by thousands and even millions. Among men the Black Death, Yellow Fever, are examples; among equines, glanders; among bovidia, anthrax and black leg; among porkers, cholera and in the feathered kingdom gape and rupe may be mentioned. Vast sums of money have been spent and literally thousands of noble and brilliant men, the world over, have given their whole lives up to a study of these diseases and means of prevention.

It is of comparatively recent date that bacteria have been proved to be the causes of disease, although as early as 1675 Antony van Leeuwenhoek, a Hollander, made discoveries which may be said to be the foundation-work for much that followed, and that has placed bacteriology among the sciences; the trouble with van Leeuwenhoek's work was that it didn't stay discovered.

It was not until a century later that "Plerciz, a physician of Vienna, declared himself a firm believer in the work of van Leeuwenhoek, and based the Doctrine which he taught upon the discoveries of the Dutch observer, and upon observations of a confirmatory nature which he himself had made. The doctrine of Plerciz assumed a casual relation between the micro-organisms discovered and described by van Leeuwenhoek and all infectious. He claimed that the material of infection could be nothing else than a living substance and endeavored on these grounds to explain the variations in the period of incubation of the different diseases. He likewise believed the living contagium to be capable of multiplication, within the body, and spoke of the possibility of its transmission through the air. He claimed a special germ for each disease, holding that just as from a given cereal only one kind of grain can grow, so by the special germ for each disease only that disease can be produced." (Abbott.)

The work and opinions of these scientists were ridiculed and no credence given them by the Medicos of their day.

It was in the 4th and 5th decades of the last century that the true relation of the lower organisms to infectious diseases was scientifically pointed out by Pasteur, Davine and others. The efforts of the bacteriologists, and Medicos in the higher animal world, have been to isolate these diseases, cultivate these germs artificially in the laboratory, identify and classify them and discover means for their destruction, which at the same time, would not destroy the host upon which they were doing their deadly work.

That similar diseases have effected the insect world is an acknowledged fact; the first important work in this direction was done by Dr. Louis Pasteur, in 1870, when the silk worm of Europe was found to be dying, and the silk industry was threatend with destruction, he proved that the disease of the silk worm was due to a bacterium and suggested means for its destruction.

Pasteur's efforts, like those of the medical world, were to destroy the pernicious bacterium, which is quite the opposite of what is necessary in the insect world, as viewed by the orchidist, as the insects are a pest and therefore to be destroyed; hence the necessity of propagating their diseases and disseminating them to the fullest extent.

In 1883 Prof. Forbes gave to the world an account of the work in his laboratory with the disease of the cabbage worm (*Piero-rapae*).

In his account the Professor showed very clearly that a disease occurred among cabbage worms and that it could be destroyed artificially among these insects.

In the Northwest a disease for the chinch bug has been disseminated to the extent of cutting the injury of that insect down to almost nominal loss.

As early as 1892 D. W. Coquillett of the Division of Entomology, U. S. Dept. of Agri., reported as follows: A few weeks ago Mr. C. H. Richardson, of Pasadena, one of the county inspectors of fruit pests, showed me several pear trees in that locality which a year ago were very thickly infested with these scales [San Jose], as was evidenced by the gnarled appearance of the branches as well as by the dry scales still adhering to the trees. After a careful examination of these scales scarcely a live one could be found. Mr. Richardson assured me that the trees had not been treated with any kind of insecticide and they certainly gave no signs of such treatment. The dead scales gave no signs of having been destroyed by lady birds, nor yet by internal parasites. Wishing to ascertain if this singular mortality was general in other localities, I examined several infested pear trees in this city, but found that the fruit and new growth upon them were thickly infested with scales, which were alive and to all appearance in a very thriving condition. It would appear therefore, that the mortality among the San Jose Scales was entirely due to some low form of fungus growth.

In 1897, the Florida Agricultural Station sent me several cultures and many specimens of a fungus disease (*sphaerostilbe coccophila*, Tul.) of the San Jose scale. These cultures as well as the diseased scale were very generally distributed throughout Southern California. Whether it was the result of the disease spoken of by Mr. Coquillett or of the imported disease from Florida or both, the fact remains that whereas ten years ago the San Jose scale was one of the worst pests on deciduous trees it is today practically unknown in Southern California.

Diseases of the Red Scale have also been noted in Australia, as well as in the lower part of the State. Attempts to reproduce them and

make them destructive in the orchard have not so far been successful. Mr. E. K. Alpaugh, of Los Angeles, who has a ranch at Sunny Sloep, in the San Gabriel Valley, called my attention to the fact that it was much less in his orchard than it had been formerly. A visit to the ranch indicated to me that a disease was attacking his scale and cultures of the supposed diseased scale have been made, but without definite results as yet.

During the summer of 1898, I found on trees in San Bernardino county some black scale (*Lecanium oleae*), that were evidently diseased.

I brought samples of these scales to our laboratory in Los Angeles, where cultures of the fungus, which was apparently getting in its deadly work, were made. Subsequently many cultures of this fungus were made and were distributed widely through our scale infested districts. In some districts the work was quite effective that season. Mr. A. B. Smith, of San Dimas, had his ranch cleaned up by this fungus. In other places the disease seemed to make little headway.

Believing that a disease is by far the cheapest method of getting rid of our scale pests, this department has persistently continued to make cultures annually, and has distributed them widely through Southern California. These have thrived, more or less indifferent, for a short time and then disappeared. This year the results were quite different, and I find that this fungus disease has been doing effective destruction in many localities, and it would appear to have become acclimated and I trust has come to stay, although it seems to have been "winter killed", for several successive years.

The fungus is grown in Petrie Dishes, i. e., cultures are made of it on pieces of sterilized bread about 2 inches in diameter. When the cultures are made they can be kept a long time, under proper conditions, ready at any desired time for application. At the proper time three of them are mixed with a barrel of water at a temperature of about 70 degrees Fahrenheit. Such a barrel containing 45 gallons of water is enough to spray 1600 trees. I have done this by merely spraying, through an ordinary hand syringe, say one pint of the mixture on a tree. Every fifth tree is enough to put the spray upon.

On one tree at least wet a limb infected with the scale with the mixture and wrap with piece of cloth also wet with the mixture, (a cloth about 2 inches wide and 3 feet long will answer). This cloth should be kept moist for a week, thus enabling the spores to get a start upon its host. If the fungus gets a start on any tree it will more than likely spread, not only over the orchard, but throughout the neighborhood.

It is evidently desirable that tests should be made as extensively as possible of this method of destroying the black scale, and the work will be continued by this department.

South Pasadena, California, December, 1905.

BULLETIN

OF THE

Southern California Academy of Sciences

Committee on Publication:

C. A. Whiting, Sc. D., D. O. A. Davidson, C. M., M. D. Wm. H. Knight

CONTENTS

Transactions	35
Additions and Corrections	35
Errata	37
A Butterfly New to Southern California	38
Contributions to the Lichen-Flora of Southern California	38
A Few Words on Tumors	45
A Preliminary Synopsis of the California Cyperaceæ (Continued)	47

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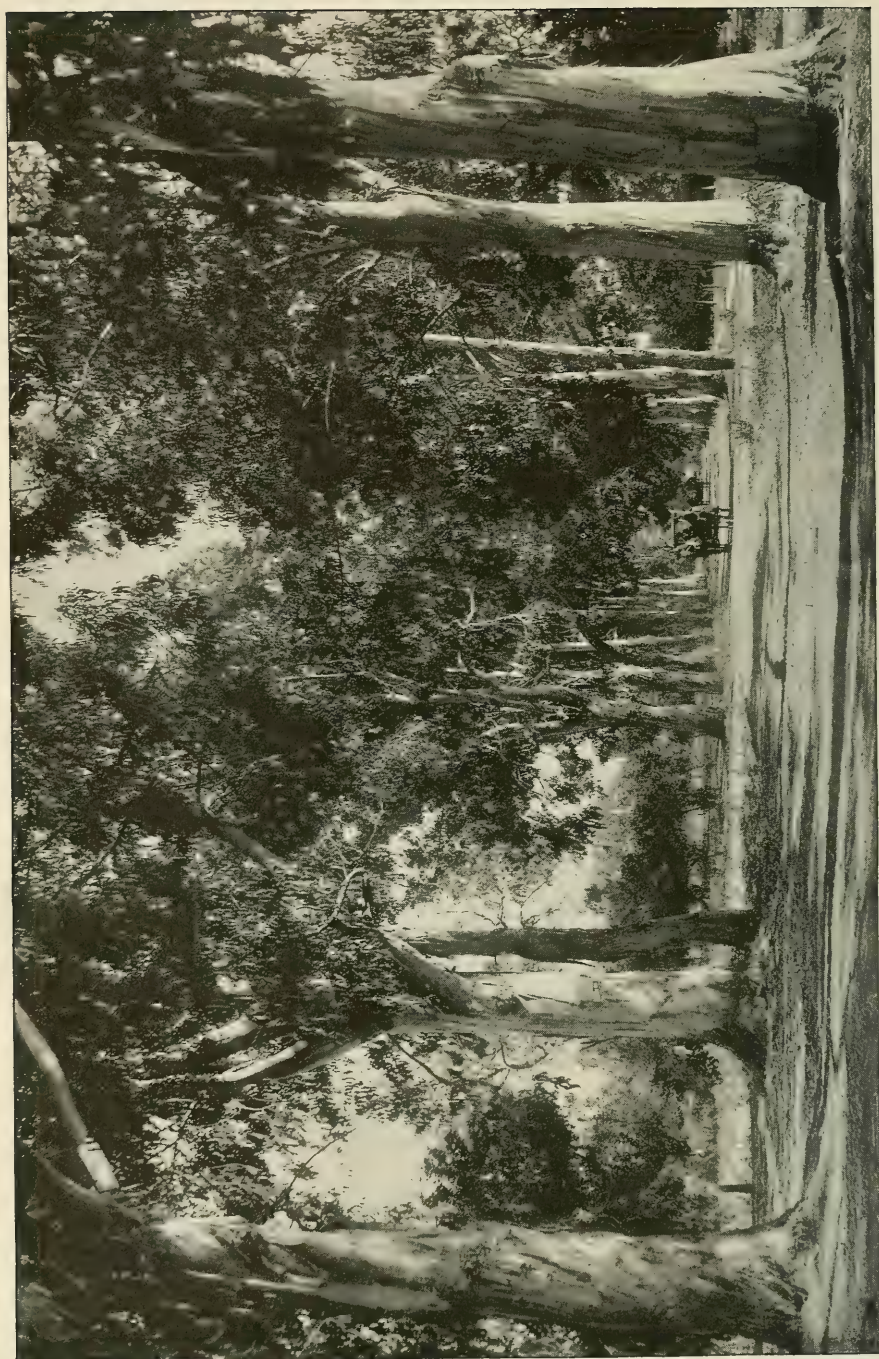
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TRANSACTIONS

BOTANICAL SECTION.

The Botanical Section met on April 16, 1906.

Dr. Davidson showed specimens of the ferns of Arizona and California. A paper by Dr. Haase on "Contributions to the Lichen-flora of Southern California" was read.

T. PAYNE, Secretary.

GEOLOGICAL SECTION.

On Monday evening, April 16th, the Geological Section met at Symphony Hall. The meeting was called to order by B. R. Baumgardt. On motion of G. M. Taber, and seconded by Prof. Dozier, Geo. W. Parsons was elected chairman of the Section for the ensuing year. No election of secretary was held.

The chairman introduced Mr. Oscar H. Reinholdt, late consulting engineer of the United States concessions in the Philippines, who gave a very interesting lecture on the Philippines, and exhibited about 150 slides of the islands and their scenery, also the characteristics of the people. His description was very interesting, and the thanks of the Academy was extended to him.

G. MAJOR TABER, Secretary.

BIOLOGICAL SECTION.

April 9th.

The April meeting of the Biological Section was held in the histological laboratory of the Pacific College of Osteopathy.

In the absence of the Chairman, the Secretary called the meeting to order.

The minutes of the last meeting were read and approved.

As this meeting was the one preceding the election of officers for the Academy, the officers of the Section for the ensuing year were elected.

C. A. Whiting was elected Chairman of the Section and Carle H. Phinney Secretary.

The lecture of the evening was delivered by Miss Susan Stokes, of the Orange High School, on the Relationship between the Molds and Algae. Miss Stokes showed by a striking succession of plants how the molds have probably degenerated from the Algae.

The lecture was followed by considerable discussion which was both entertaining and profitable.

About thirty-five members and visitors were present.

On motion the meeting adjourned.

C. A. WHITING, Secretary.

Additions and Corrections

Vol. 3, page 49.

The authority for *Cyperus bromoides* should be Link, Jahrb-Berl I, 3:85.

Vol. 4, page 52.

Pistillate spikes loose, few-flowered.

Stigmas 2; perigynia pyriform.

Perigynia coriaceous, green.

Scales ovate-oblong, equalling the perigynia.

14a. **C. Californica**

Scales broadly ovate, shorter than the perigynia.

15. **C. Hassei**

Perigynia fleshy, yellowish.....15a. **C. aurea**

Vol. 4, page 110.

***Pistillate spikes few, short, oblong, loosely-flowered, the upper sessile and approximate at the base of the solitary staminate spike, the lowest remote and borne on a long slender stalk; bracts grass-like; sheathing at base; perigynia pyriform or oblong, nerved, beakless; stigmas 2.*

→ Perigynia firm and coriaceous in texture, green.

14a. **Carex Californica**, Bailey, Mem. Torr. Club, 1:9. **C. polymorpha**, W. Boott in Wats. Bot. Cal. 2:247.

Caespitose by slender, naked rhizomes; culms filiform, 5-10 cm. tall; leaves 2-4 mm. wide, nearly equalling the culms; pistillate spikes 2-4, 4-10 mm. long; scales as long as the perigynia, ovate-oblong, mucronulate, brown with broad green midvein; perigynia elongated pyriform.

Described from immature specimens collected July, 1905, at Sawmill Mt., 8,500 ft. alt., Ventura Co., by Mr. H. M. Hall, No. 6518. The type is 4741 **Bolanderi**, collected in Mendocino Co.

15. **Carex Hassei**, Bailey. See page 110.

→ → Perigynia fleshy, yellowish and more or less translucent when dried, at length brownish.

15a. **Carex aurea**, Nutt. Gen. 2:205. W. Boott in Wats. Bot. Cal. 2:240. Bailey, Proc. Am. Acad. 22:110. Britt. & Br. Ill. Fl. 1:331.

Caespitose; culms smooth, slender and erect, 1-10 cm. tall; leaves flat, 3-5 mm. wide, shorter than the culms; scales hardly half the length of the perigynia, brown with a yellowish midvein, and hyaline margins, broadly ovate, acute; perigynia obscurely nerved, 2 mm. long.

In a meadow, between Bear Valley and Bluff Lake, 7,000 ft. alt., San Bernardino Mts.: 2847 Abrams. San Antonio Mt., near the summit; Mrs. H. E. Wilder. North to British Columbia; also in the Rocky Mts., and in the northern Atlantic states. Readily distinguished from **C. Hassei** by the texture and color of the perigynia.

Errata

A considerable part of this paper was printed without the author's correction of the proof, and contains many typographical errors. Most of these the reader will readily correct, but some, which are less evident, are noted below:

Vol. 3, page 50. Line 8 from bottom; omit **stamens** 3, for **artistatus** read **aristatus**.

Page 52. Line 15, for **mm.** read **cm.**

Page 113. Line 7, for **C. triangularis** read **S. triangularis**.

Vol. 4, page 66. Line 24, for $\frac{3}{8}$ read **3-8**.

Page 67. Line 24, for ++ read ++++

Line 32, for **cm.** read **mm.**

Last line, for **olivanceous** read **olivaceous**.

Page 80. Line 4, prefix ++

Line 29, prefix **

Line 32, prefix +

Page 82. Line 16, prefix ++

Line 19, prefix ++

Last line, for +- read ++++

Page 114. Line 1, for **spikes** read **spike**.

Line 2, for **achems** read **achenes**.

Next to last line, omit **then**.

Vol. 5, page 24, line 12, for **accuminatatis** read **accuminatis**.

Page 26, line 4. After Plate XXII insert Fig. 6.

The Plate on page 25 should be numbered Plate XXI; that on page 27 Plate XX.

A Butterfly New to Southern California

BY PROF. J. J. RIVERS, SANTA MONICA

Eudimus proteus. A wanderer over many lands made a visit in force to Santa Monica and was to be seen regaling its taste at the inflorescence of many different plants. It, however, was partial to arborescent places near bean fields. The species has not been noticed in California before last season, and whether it will become a regular resident is problematic, as it has a range from New York through all the southern states, Mexico, and several states in Central America.

Mr. G. W. Wright informs me that this species of butterfly occurred commonly last season in San Bernardino county as well as along the country bordering on Mexico. Mr. Stevens reports its appearance at San Diego.

Contributions to the Lichen-Flora of Southern California

BY DR. H. E. HASSE

- Acolium tigillare**, (Ach.) DeNot. On a dead shrub near Marietta Hot Springs. Foothills near Stanford University. (C. F. Baker).
- Collema fasciculare**, Hoffm. On bark, S. M. range. Crombie, Bri. Lich. I. p. 56. Nyl. Syn. Lich. I. p. 115.
- C. coccophorum**. Tuck. Earth at Palm Springs and Murietta Hot Springs, Riverside county. San Gabriel Canyon, Los Angeles county.
- Collemopsis Arnoldiana**, Nyl. Among moss on rocks, Strawberry valley, San Jacinto Mts.
- Pyrenopsis melambula**, Tuck. On clay, foothills near Casa Verdugo, Los Angeles county. Tuck. Syn. N. A. Lich. I. p. 136.
- P. phaeococca**, Tuck. On sandstone in S. M. range,—Santa Cruz Mts. (A. C. Herre).
- Collemodium fragile**, Nyl. Thallus minute, scattered, black. Apothecia brown, ureceolate. Sp. muriform, decolorate, 28 to 36 micros. long, 15 to 16 micros thick. Slate rocks S. M. range. Cromb. 1. c. p. 65.

- Cladonia sobolifera**, Nyl. S. M. range.
Cromb. 1. c. p. 134.
- Leptogium pusillum**, Nyl. North Fork Matillija Canyon, Ventura county.
Cromb. 1. c. p. 65.
- C. fimbriata**, Fr Subsp. *C. fibula*, Nyl. var. *subcornuta*, Nyl. Foothills of San Gabriel range.
Cromb. 1. c. p. 138.
- Usnea dasypoga** *scabrata*, Nyl. Shrubs, S. M. range. Cataline Isle.
(Blanche Trask). No Apothecia have been seen.
- Ramalina linearis**, (*R. canaliculata*. Tal.)
Shrubs, S. M. range.
- R. calicaris fastigiata**, Fr. Trunks, San Gabriel range.
- Parmelia saxatilis**, Ach. f. *furfuracea*, Shaer. On granite, Mt. Wilson.
Cromb. 1. c. p. 241.
- P. prolixa panniformis**, Nyl. Rocks, Yosemite Valley.
- P. flavicans**, Tuck. Rocks, S. M. range.
- Physcia pulverulenta**, Nyl. f. *argyphaea*. Nyl. S. M. range.
Cromb. 1. c. p. 306.
- Ph. pulverulenta**, Nyl. Subsp. *Ph. isidiigera*, Zahlbruckner. Subsp. nov. First discovered by Prof. A. C. Herre in the Santa Cruz mountains. North Fork Matillija Canyon, Ventura county, and San Jacinto Mountains.
A. C. Herre: "The foliaceous and fruticose Lichens of the Santa Cruz Peninsula, Cal." — Washington, 1906. P. 362.
- Ph. adglutinata**, Nyl. f. *sorediata*, Nyl. On Juglans in S. M. range.
More frequent than the type.
Cromb. 1. c. p. 321.
- Ph. tribacea**, (Ach.) Tuck. On rocks, S. M. range. Sterile.
- Ph. leucomela**. (L.) Michx. Catalina Island on twigs. (Blanche Trask.)
- Theloschistes ramulosus**, Tuck. on various barks, S. M. range. Near Stanford University. (C. F. Baker.) Santa Cruz Peninsula. A. C. Herre. L. c. p. 349. It is easily overlooked.
- Omphalaria symphorea**, (D. C.) Spores round-ellipsoid, 8 micros. long, 6 micros. thick, about 20 in asei.
Palm Springs, Riverside County.
- Pannaria sonomensis**, Tuck. On rocks, Yosemite Valley (sterile) and North Fork of Matillija Canyon, Ventura county in fruit.

- Placodium murorum**, (Ach.) Subsp. *Pl. tegularis*, Nyl. var. *obliterascens*, Nyl. Rocks San Gabriel Canyon.
Cromb. I. c. p. 361.
- Pl. fulgens**, (Sw.) D. C. On earth, Palm Springs, Riverside county.
- Lecanora pelicypha**, Nyl. Thallus of bright-chestnut shining squamae (K.). Apothecia immersed, small finally enlarging, disk, brown, flat. San Bernardino Mts. "Prospect Peak" near Seven Oaks, also at Wilson's Peak, San Gabriel range.
Cromb. L. C. p. 483.
- L. rugosa**, Nyl. On barks, Catalina Island, (Blanche Trask) and S. M. range.
- L. gangaleoides**, Nyl. On sandstone near Adamana, Arizona.
Cromb. p. 316.
- L. Polytropa**, Shaer. f. *subglobosa*, Cromb. on sandstone, S. M. range. Cromb. I. c. p. 438.
- L. polytropia illusoria**, Auctt. San Bernardino Mts. (S. B. Parish.)
- L. calcarea contorta**, Fr. f. *monstrosa*, Cromb. Sterile, S. M. range. Cromb. I. c. p. 474.
- L. glaucocarpa depauperata**, Cromb. S. M. range.
Cromb. I. c. p. 481.
- L. simplex**, Nyl. f. *complicatum*, Cromb. S. M. range.
Cromb. I. c. p. 490.
- L. simplex**, Nyl. f. *complicatum*, Cromb. S. M. range.
Cromb. I. c. p. 490.
- L. simplex**, Nyl. f. *strepsodina*, Ach.
Cromb. I. c. p. 490.
Both forms occur on quartzose rocks in the San Gabriel and Santa Monica ranges.
- L. Bockii**, (Fr.) Th. Fr., Rocks, San Antonio Canyon.
- Pertusaria leioplaca**, (Ach.) Shaer. On Juglans, S. M. range.
- P. ambigens**, (Nyl.) Tuck. On Umbellularia near the old Sturtevant camp, San Gabriel range.
- Biatora conglomerata**, (Fr.) On charred bark of a conifer, San Gabriel range and on dead wood of *Aretostaphylos* in S. M. range.
- B. Nylanderii**, Anz. On pine bark in San Gabriel Canon.
- B. Friessii**, (Ach.) Decorticated pine logs, Strawberry valley, San Jacinto Mts.
- B. punctella**, Willey. Thallus obsolete, apothecia minute, convex, immarginate, light brown. Spores 8 nae, simple, ellipsoid 8 micr. long, 4 micr. thick. Paraphyses separate with pale brown, blobular heads. Asci oblong, 24 micr. in length, 10 micr. thick. Hymenium (Thecium of Dar-

- bishire) 32 to 34 micr. high, hypothecium colorless.
Hym. gel. stained pale blue with jodine. On decorticated wood of *Sambucus glauca*, S. M. range.
- B. subviridis**, (Nyl.) On slate rock, S. M. range.
Leighton Li. Flora Gr. Bri. 3 edit. p. 331.
- B. prasina**, Fr. Soldiers' Home grounds on bark of fig trees.
- B. sylvana**, Ach. Twigs on Catalina Island.
Leight. 1 c. p. 264. (*B. minuta*.)
- B. viridescens**, (Schrad.) Fr. Spores oblong-ovoid, 12 micr. long, 4 micr. thick. Bark of *Pseudotsuga*, San Gabriel range along the old Wilson trail.
Tuck, 1 c. part II, p. 17.
- B. Schweinitzii**, Fr. On *Heteromeles*, S. M. range.
- B. atro-grisea**, (Dicks.) Hepp. On *Umbellularia* in the San Gabriel range.
- B. fusco-rubella**, Hoffm. On *Rhus diversiloba*, canons of S. M. range.
- B. moriformis**, (Ach.) Bark of pines, San Gabriel range and San Bernardino Mts. near Seven Oaks.
Tuck. 1. c. Part II, p. 50.
- Lecidea lenticularis**, Ach. f. *ecrustacea*, Hepp. On sand stone, Catalina Isle.
Leight. 1. c. p. 336.
- L. contigua**, Fr. f. *calcarea*, Fr. Frand Canon, Arizona.
Leight. 1. c. p. 300.
- L. tessellata**, Flk. On granite, San Jacinto Mts.
- L. chalybeia**, Borr. Rocks, North Fork of Matilija Canon, Vent. Co.
Leight. 1. c. p. 326.
- L. cruciaria**, Tuck. On sand rock in same locality as the last.
- L. polycarpa**, Fr. On rocks in S. M. R. near Hollywood.
- L. morio**, Shaer. Thallus of small brown, convex equamules, bordered by a conspicuous black hypothallus. On granite.
- L. sarcogyniza**, Nyl. On rocks near Claremont. (C. F. Baker.)
Leight. 1. c. p. 312.
- L. pycnocarpa**, Koerb. On rocks, S. M. range.
- Arthonia pyrrhuliza**, Nyl. Apothecia brown, radiating or sinuous. Spores 3 to 4 septate, 22 micr. long, 8 micr. thick, the upper locule the largest. Catalina Isle on *Prunus illicifolia integrifolia*.
Willey. Syn. Arth. No. 84.
- A. epipastoides**, Nyl. On Juglans, S. M. R.
Willey 1. c. No. 264.
Leight. 1. c. p. 420.

- A. polygramma**, Nyl. Thallus white, somewhat mealy or scaly. Apothecia immersed, brown, white pruinose, palmate or sinuate. Spores 4 to 5 septate, 22 micr. long, 7 thick. Catalina Island on *Rhus integrifolia*.
- A. impolita chiodectionoides**, Tuck. On *Alnus rhombifolia* in S. M. R.
- A. gregaria**, (Weig.) Kbr. f. concolor, T. & B. Soldiers Home grounds on cultivated shrubs.
Willey 1. c. No. 43.
- A. gregaria pruinata**, Delis. Catalina Island on Oak. (Blanche Trask.)
Willey 1. c. No. 43.
- A. adveniens**, Nyl. Thallus light ash colored or almost white. Sp. colored, 5 to 6 septate and some cells divided longitudinally, 24 micr. long and 12 micr. thick. On *Juglans*. In canons of S. M. range.
Willey 1. c. No. 329.
- A. polymorpha**, Ach. Thallus ash colored, rimulose, indistinctly bordered by a black line. Sp. 3-septate, oblong-ovoid, with both end cells the larger. On *Rhus laurinum* in S. M. R.
Willey, 1. c. No. 248.
- A. interveniens**, Nyl. Thallus ash colored. Apothecia brownish-black, round of irregular out of line. On *Platanus*, *Sam-bucus* and *rhus*. S. M. range.
- A. quintaria**, Nyl. On *Aplopappus ericoides*, bluffs near Playo del Rey. Thallus white, apothecia black, substellate. Spores oblong, 5 to 7 septate, the cell at thick end the largest, 24 micr. long, 10 micr. thick. Asci 52 micr. long, 28 thick, pyriform. Hym. gel. with iodine stained a dirty yellow.
Willey, 1. c. No. 248.
- A. radiata angustata**, Willey. On *Quercus agrifolia* in S. M. range. In 1895 I submitted a Lichen from oaks of Catalina Isle to the late Dr. Stizenberger, who named it *A. tetramera*. Both Lichens are similar in appearance and the spores are alike in septation, size and form.
- Opegrapha prosiliens**, Strn. Thallus sordid white. Lirellae oblong brown-black. Sp. 3-septate, blunt fusiform, colorless with a thick gelatinous epispore, 24 micr. long, 7 thick. Paraphyses slender, branching. Hymenium about 80 micr. high. Asci 72 micr. long, 18 micr. thick. On *Juglans* in S. M. range.
Leight. 1. c. p. 403.
- O. varia**, Pers. f. **pulicaris**, Lightf. On *Quercus* in S. M. range.
Leight. 1. c. p. 404.

- O. varia**, Pers. f. **tridens**, Ach. On Juglans, S. M. range.
Leight. l. c. p. 405.
- O. constrictella**, Strn. On twigs, San Diego. (R. D. Alderson.)
- Endocarpon conyomescens**, Nyl. Sp. 12 to 14 micr. long, 8 to 10 thick.
On granite near Elsinore.
A. Hue, Addenda Lichenogr. Europ. 1886. No. 1658.
- E. Garovaglii**, Mnt. On rocks at head of Bright Angel trail, Grand Canon, Arizona.
Leight. l. c. p. 491.
Nyl. Envir. Paris, 1896, p. 117.
Hue, l. c. No. 1665.
- E. adnatum**, Nyl. Thallus squamulose, sinuately lobed, reddish-brown, beneath dark, the squamules 4 to 5 mm. in diameter. Sp. faintly colored, 40 to 50 micr. long, and 16 to 20 thick, ovate oblong, muriform. On earth, Palm Springs.
Hue, l. c. No. 1668.
- E. pallidum**, Ach. Thallus of pale-rufous, small squamules. Spores 2, not uniform in shape or measurements, decolorate to pale brown, broadly oblong, 48 to 58 micr. long, 22 micr. thick, and narrowly oblong, 80 to 96 micr. long, 16 to 18 thick, muriform with about 11 transverse septa and 5 longitudinal. Asci 144 micr. long and 24 micr. thick. The upper, thick fundus of the ascus being occupied by the thick spore, the lower attenuated end by the narrow oblong one. On earth at Elsinore and on disintegrated granite at Palm Springs.
Hue, l. c. No. 1664.
Leight. l. c. p. 491. (Verrucaria.)
- E. tephroides**, (Ach.) v. **cartilagineum**, Nyl. Thallus cartilagineous of undulating, imbricated, brown squamae, the margin lobate and crenate, toward the circumference tending to become radiate. Apothecium indicated as a projecting dark spot with a minute puncture at apex. Sp. simple, colorless, ellipsoidal, 20 to 26 micr. long by 8 to 10 micr. thick. On earth among moss on rocks, San Gabriel range, along the old Wilson trail.
Leight. l. c. p. 459. (Verrucaria.)
- Heterocarpon ochroleucum**, (Tuck.) On granite, Palm Springs.
Tuck. Syn. l. c. Part II. p. 138.
- Enndococcus erraticus**, Nyl. Minute apothecia. Sp. brown, numerous about 24 to 32, one-septate, ellipsoid, 10 micr. long, 4 thick. Paraphyses absent, asci oblong. Parasytic upon thallus of *Lecidea lapicida*. San Gabriel Canon, Los Angeles Co. Nyl. Exot. 1892.

Hue, l. c. No. 1897.

Leight. l. c. p. 496. (Verrucaria.)

Verrucaria muralis, Ach. f. *epipolia*, Nyl. (Det. by Dr. Nylander.) Thallus scurfy, thin, sordid white. On calcite, San Gabriel range.

V. circumspersella, Nyl. Thallus white, pulverulent, effigurate. Apothecia prominent, black, shining. Sp. ellipsoid, 3-septate, 24 to 26 micr. long, 7 to 8 thick. Asci tubulra. Paraphyses distinct, capillary, with odine faint yellow. Calcareous rock, Malibu Canon, S. M. range.

Hue, l. c. No. 1755.

V. epidermis, Ach. Thallus white, mealy, apothecia semi-globular, covered by thallus. Sp. 1-septate, the two cells constricted and at times falsely septate at constriction. Paraphyses stout, articulated, branching. On *Euphorbia misera*, San Clemente Island. (Blanche Trask.)

Leight. L. C. p. 463.

V. epidermidis cinerea-pruinosa, Schaer. On *Platanus*, S. M. range.

Leight. l. c. p. 464.

V. epidermis apalepta, Ach. Soldiers' Home grounds on *Grevillea*.

Leight. l. c. p. 463.

V. chlorotica, (Ach.) On *Frazinus dipetala*, San Gabriel Canon.

Leight. l. c. p. 472.

Hue, l. c. No. 1773.

V. chlorotica, (Ach.) f. *trachona*, (Taylor.) Thallus pulverulent. Sp. 3-septate, fusiform, 27 to 30 micr. long, 8 micr. thick. Argillaceous rock, S. M. range.

V. conturmatula, Nyl. Thallus absent. Sp. 1-septate, 16 micr. long, 8 thick. Paraphyses indistinct. On quartz, San Gabriel Canon.

Hue, l. c. No. 1838.

V. punctiformis diminutula. Nyl. Sp. 1-septate, 22 to 28 micr. long, 7 to 7½ thick. On oak, Strawberry Valley, San Jacinto Mts.

Hue, l. c. No. 1845.

Leight. l. c. p. 467.

V. cerasi, (Ach.) On *Malvastrum fasciculatum*, S. M. range.

Leight. l. c. p. 471.

Hue, l. c. No. 1849.

V. integrella, Nyl. Sp. smaller than those of *V. integra*, of which it is made a subspecies by Nylander. On earth, (forma terrestris.) S. M. range.

Hue, l. c. No. 1729.

- V. microbola**, Tuck. Thallus mealy, thin, areolate-diffract. Apothecia small, black, depressed globular with a minute aperture. Spores colorless, 3-septate, ellipsoid, 28 micr. long, 16 thick. Paraphyses none or indistinct. On calcareous rock, Mill Creek Canon, San Bernardino Mts.
- V. margacea acrotella**, Ach. Rocks, S. M. range. Leight. l. c. p. 448.
- V. cinerea**, (Pers.) On *Rhus diversiloba*, S. M. range. Leight. l. c. p. 464.
- V. achrostoma**, Borr. Thallus brownish-black, areolate. Apothecia apparently entire, immersed with a small black ostelium. Sp. 8 nae, simple, colorless, 1-nucleolate, ovoid ellipsoid, epispore delicate, 18 micr. long, 8 thick. Asci 56 micr. long, 20 thick. Paraphyses absent. With Jodine the Hymenium is stained dull violet. On sandstone, Ballona Bluffs, Los Angeles Co. Leight. l. c. p. 454.
- V. fusco-cinerascens**, Nyl. Parathecium dimidiate, sp. ellipsoid, simple, oblong, 30 micr. long, 7 thick. Rocks, Malibu Canon, S. M. range. Leight. l. c. p. 451.

A Few Words on Tumors

C. A. WHITING, SC. D., D. O.

The pathologist frequently receives vomitus, pus and various kinds of scrapings, for examination, to determine the presence or absence of "cancer cells." The laity practically unite in believing that cancer cells materially differ from all normal cells, and this belief is held by many physicians who have not had careful training along the line of structural pathology.

There are two laws relating to abnormal growths which are the keys to all correct thinking and reasoning. The first is that all cells of whatever nature found in the body have been derived from pre-existing cells, and the second is that the tissue which forms a tumor of any kind resembles in its general structure tissue which is normal to either the adult or embryonic body. These two statements being true, it will readily be seen that it is by no means easy to exactly define a tumor, as almost

any part of the body is subject to more or less hypertrophy or overgrowth. For practical purposes a hypertrophied condition means not only an increase of the part in size, but also in function, while the term tumor means an increase in size with no corresponding increase in function. A forcible illustration of these two conditions may be drawn from a normal and an abnormal accumulation of fat. Even a normal accumulation of fat may be very much localized, as when, for instance, it is chiefly confined to the omentum, but however localized a normal accumulation of fat may be, it is readily utilized when demanded by the necessities of the body, but a lipoma or fatty tumor remains practically unaffected by the needs of the body, even if these needs press to the point of starvation.

A hypertrophied gland is capable of more functional activity than a strictly normal gland, as, for example, the highly hypertrophied mammary gland of the domestic cow compared with the strictly normal gland of the buffalo cow, while a gland enlarged by an adenoma—a gland like tumor—is never more active and usually much less active than a strictly normal gland.

Pathologists recognize two distinct kinds of tumors, those which are formed from epithetical cells and those which are formed from connective tissue cells. Cancers belong to the first class.

Tumors of both classes closely resemble normal tissue in their nutrition, and they usually have about the same nerve supply. As the tumor increases in size, the blood supply is more or less affected and thus the cells composing the tumor are placed in a changed environment, which quickly reacts upon their structure and function.

Owing to this fact, the clear distinction between cells of different tissues, which exists in normal structures, becomes more or less obliterated and in many cases these distinctions become so illy defined that the positive identification of a given tumor becomes a matter of extreme difficulty or in some cases an impossibility.

I am aware that the foregoing statements are quite out of harmony with the views of many writers and lecturers on Pathology, but I believe that the laboratory experience of practical workers is in harmony with the views expressed.

A Preliminary Synopsis of the Southern California Cyperaceæ. XII.

BY S. B. PARISH

(Continued from page 20, Vol. 5)

*Section 2. HYPARRHENÆ, Fries, Summa, 72. Staminate flowers borne at the base of the spikes, or, in a few species, variously intermingled with the pistillate, or whole spikes staminate or pistillate, or plants dioecious. * Staminate flowers not always confined to the base of the spikes; perigynia brown, ovoid, or nearly so, firm, obviously distended over the achenes. + Spikes 2-4, distant, 3-9 flowered, perigynia wingless, stellately divergent at maturity.*

- ✓ 29. **Carex stellulata ormantha**, Fernald, Rhodora, 3:222. **C. echinata ormantha**, Fernald, Proc. Am. Acad. 37:483, t. 4, f. 8, 9. **C. echinata**, W. Boott in Wats. Bot. Cal. 2:237, in part.

Culms filiform, smooth, 1-3 dm. tall; leaves erect, about 1 mm. wide, shorter than the culms; bracts scarious, or the lowest aristate; terminal spike clavate by the attenuation of the staminate flowers, the others subglobose, and mostly wholly pistillate; scales brown, nearly as long as the perigynia, ovate-acuminate; perigynia narrowly ovoid, nerved or nerveless on the inner face, 3-4 mm. long, the bidentate, serrulate beak nearly as long as the body.

In a wet meadow, at Bluff Lake, 7,400 ft. alt., San Bernardino Mts., June, 1894, 1895; 3274, 3703 Parish. Northward in the Sierra Nevada to Oregon; also in New England. The type was collected in the mountains of El Dorado county, by Dr. Brainerd. The plant is reported to be sometimes dioecious.

Plate XXIII. Fig. a. Immature head.

+ + Spikes larger, 4-7, distant, or the uppermost loosely clustered; perigynia thick, wingless, erect.

- ✓ 30. **Carex Bolanderi**, Olney, Proc. Am. Acad. 7:393. Fernald, Proc. Am. Acad. 37:491. **C. Deweyana Bolanderi**, W. Boott in Wats. Bot. Cal. 2:236. Bailey, Proc. Am. Acad. 22:146.

Culms slender, roughish above, 5-10 dm. tall; leaves flat, short-pointed, 3-5 mm. wide, shorter than the culms; bracts scale-like, 1-2 of the lowest usually aristate; spikes oblong to ovoid, acute, about 1 cm. long, the uppermost staminate at base the others usually entirely pistillate; scales light brown, as long as the perigynia, scarious, rough-cuspidate by the extrusion of the green midvein; perigynia nerved on the back, 3-4 mm.

long, contracted to a narrow, deeply bidentate beak, half as long as the body; achenes castaneous, lenticular, broadly ovoid, 1.5 mm. long.

Mill Creek Falls, 6,000 ft. alt., San Bernardino Mts., July, 1892; 2486 Parish. The southern limit, thence northward, in the Sierra Nevada Mts., to Washington.

Plate XXIII. Fig. b.

 *Spikes 3-4, contiguous in a linear-oblong head.*

31. **Carex prae-gracilis**, W. Boott, Bot. Gaz. 9:87. Bailey, Proc. Am. Acad. 22:144.

"Stem (the lower part and stem leaves wanting) 26 in. high, straight and slender, scarcely half a line broad on the side, the sharp angles rough above. Sterile leaves thread-like, convolute, the cross-section exactly circular. Spike ferrugineous, oblong-linear, one-half inch long, of 3-4 contiguous, sessile spikelets, the uppermost club-shaped, male at base, the others elliptical, female, few-flowered. Bracts from an ovate, hyaline-margined base, which encircles the stem, tapering to rough, somewhat spreading awns, which are longer than their spikelets, and commonly shorter than the stems. Scales similar to the bracts, with broader margins and shorter awns, covering the perigynia. Perigynia cartilaginous, ferrugineous, pale at base, glabrous; ovate, acuminate-beaked, slightly stalked, $1\frac{1}{2}$ lines long, $\frac{3}{4}$ lines broad, long-fissured on the outer face (the margins of the fissure whitish), convex on the outer face, the margins of the inner face incurved and serrate above, obscurely nerved. Nut chestnut, round-ovate, biconvex, filling the perigynia. Stigmas 2. Style included.

"San Diego, California, Miss Scott, 1880."

The above is the description of the type. It is not known in what part of San Diego county it was found, nor has the plant been rediscovered. The original and only specimen, apparently at best incomplete, is now in a fragmentary condition, in the Gray herbarium, except for a few fragments which are in Dr. Bailey's herbarium. Its rediscovery is much to be desired. Mr. Fernald is of opinion that it may be a *Kobresia*, rather than a *Carex*.

Plate XXII. Drawn at the Gray herbarium, from the type specimen, by Mr. P. B. Whelply, under the direction of Mr. M. L. Fernald. 1, 2, Scales 3, Bract. 4, 5, 6, Perigynia, from the pocket on the sheet. 7, 8, 9, Spikes. All are enlarged 10 diameters.

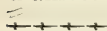
 *Spikes 3-10, loosely clustered in an irregular oblong head, 1-3 of the lowest spikes often more or less separated; perigynia strongly convex on the outer faces, the narrow wing, more or less incurved.*



PLATE XXII.

32. **Carex siccata**, Dewey, Silliman's Jour. 10:478. W. Boott in Wats. Bot. Cal. 2:230. Bailey, Proc. Am. Acad. 22:147. Britt. & Br. Ill. Fl. 1:355. Fernald, Proc. Am. Acad. 37:469, t. 1, f. 9-11.

Rhizome covered with brown scales; short-jointed, extensively creeping; culms slender, rough above, 2-6 dm. tall; leaves 1-2 mm. wide, mostly somewhat shorter than the culms; lowest bract usually short-awned; spikes oblong, 2-4 cm. long; scales nearly as long as the perigynia, ferruginous, ovate-lanceolate; perigynia few-nerved on the outer face, 3-4 cm. long, contracted to a narrow, serrulate, obscurely bidentate beak half as long as the body; achenes brown, lenticular, ovoid, 1.5 mm. long.

Common in the Cismontane region, in damp, subalkaline soil. Los Angeles; Abrams, Davidson. Pasadena; McClatchie. Peat lands, Orange Co., Helen D. Geis. San Diego; Chandler. San Bernardino; Parish. Northward to the Columbia river, and widely distributed throughout North America, from the latitude of Ohio to Ontario. Also in Northern Asia.

***Spikes all staminate at base only, compacted, or more or less distinct in large heads, except No. 35.*

+Spikes, greenish, perigynia pallid, or greenish, ovoid, conspicuously wing-margined; bracts inconspicuous, shortly aristate from a scarious base

33. **Carex feta**, Bailey, Bull. Torr. Club. 20:418. **C. straminea mixta**, Bailey, Proc. Am. Acad. 21:151. **C. lagopodioides**, W. Boott in Wats. Bot. Cal. 2:237. **C. scoparia fulva**, W. Boott, l. c., in part. **C. adusta**, W. Boott, l. c. 2:238. **C. cristata mirabilis**, W. Boott, l. c.

Culms stoutish, smooth, 3-6 dm. tall; leaves flat, 3-5 mm. wide, shorter than the culms; spikes 5-10, silvery-green, closely imbricated, ovoid to ovoid-oblong, 3-4 cm. long, distinct in an oblong, or compacted in a shorter ovoid head; scales nearly equalling the perigynia, oval, acute; perigynia obscurely nerved on the outer face, serrulate on the margin half way to the base, 3-4 mm. long, gradually attenuate to a flat, obscurely bidentate beak, one-third the length of the body; achenes castaneous, ovoid, lenticular, 1 mm. long.

San Jacinto Mts.; Hasse. Tahquitz Valley, 7,000 ft. alt., July, 1891; Fuller's Mills, 6,800 ft. alt.; 2439, 2561 Hall. Strawberry Valley, 5,700 ft. alt.; Jepson & Hall. San Bernardino Mts., in Waterman Canyon, 3,000 ft. alt., Aug., 1891; 2514 Parish.

Plate XXIII. Fig. c.

✓ 34. **Carex specifica**, Bailey, Mem. Torr. Club. 1:21. **C. scoparia fulva**, W. Boott in Wats. Bot. Cal. 2:237, in large part. Bailey, Proc. Am. Acad. 22:148.



PLATE XXIII.

Culms stout, slightly roughened at the top, 5-7 dm. tall; leaves short-pointed, 5-6 mm. wide, shorter than the culms; spikes 5-10, ovoid-oblong, 7-15 mm. long, loosely imbricated, distinct, clustered in an ovoid or ovoid-oblong greenish-brown head, 3-4 cm. long; scales nearly as long as the perigynia, brown, with green midvein, sharply acuminate; perigynia serrulate on the margin nearly to the base, nerveless, about 4 mm. long, narrowed to a flat, bidentate beak, nearly as long as the body; achenes oblong, lenticular, 1.75 mm. long.

In wet meadows in the Nevadan region, San Bernardino Mts. Fredalba Park, 5,600 ft. alt.; S. Grout. Deep Creek; 2767 Abrams. Mill Creek, 5,000 ft. alt.; Bear Valley, 6,500 ft. alt.; Strawberry Valley, 5,200 ft. alt.; Little Bear Valley, 4,500 ft. alt.; 1161, 3609; 2930, 1698 Parish. San Jacinto Mts. Strawberry Valley, 5,250 ft. alt.; Fuller's Mills, 6,800 ft. alt.; 2665, 3609 Hall. Allen's Camp, 4,500 ft. alt.; Hasse.

Plate XXIII. Fig. d.

++ Spikes brown or tawny.

++ Heads small; perigynia loose at maturity, brown, thick, wingless and smooth on the edges, the orifice of the narrow beak entire, or obscurely toothed,

✓ 35. **Carex illota**, Bailey, Mem. Torr. Club, 1:15. **C. Bonplandii angustifolia**, W. Boott in Wats. Bot. Cal. 2:233. Bailey, Proc. Am. Acad. 22:153.

Culms erect, slender, nearly smooth, 6-40 cm. tall; leaves 1-2 mm. wide, shorter than the culms; the inconspicuous bracts awnless; spikes 3-6, ovoid, 2-4 mm. long, compacted in a dark brown, globose, ovoid or short oblong head, 5-10 mm. long, 5 mm. thick; scales shorter than the perigynia, brown, ovate, acute; perigynia dark brown, ovoid to ovoid-lanceolate, spongy at base, 2-3 mm. long, the beak nearly as long as the body; achenes oval, plano-convex, mucronalate, 1 mm. long.

In wet meadows, Bluff Lake, 7,500 ft. alt., in the San Bernardino Mts.; June, 1894; 3273 Parish. Northward throughout the Sierra Nevada to Oregon; also in Colorado.

Plate XXIII. Fig. e.

+++ Heads larger; perigynia pallid, thin and scale-like, the winged margins serrulate, and the flat beaks more or less deeply bidentate; achenes lenticular, orbicular to oblong, about 1 mm. long.

== Bracts inconspicuous, muticous or short awned from a broad, scarious base, all but the lowest usually rudimentary or wanting.

✓ 36. **Carex Preslii**, Steud. Pl. Cyp. 2:42. Bailey, Mem. Torr. Club, 1:52. **C. leporina Americana**, Olney, Proc. Am. Acad. 7:407. Bailey, Proc. Am. Acad. 22:152.

Culms erect, unequal, slender, smooth, or nearly so, 1-3 dm. tall; leaves stiff and erect, long-pointed, 1-2 mm. wide, shorter than the longer culms; spikes 5-10, oblong, 4-5 mm. long, distinct in an ovoid, or ovoid-oblong cluster, 1-2 cm. long; scales as long as the perigynia and broader, ovate, acute; perigynia erect, ovoid to ovoid-lanceolate, serrulate nearly to the base, 2.5-3.5 mm. long, the beak one-third as long as the body.

Growing among rocks, at the summits of the highest mountains. San Antonio, 10,080 ft. alt. and San Gorgonio (Grayback) 11,485 ft. alt., Mrs. C. M. Wilder. San Jacinto, 10,800 ft. alt.; 2416 Hall. An alpine species, ranging north to Alaska; also in Colorado and Utah. Mr. Brandegee has collected it on San Pedro Martir Mt., in Lower California, its probable southern limit. The type was from Nootka Sound.

Plate XXIII. Fig. f.

✓ 37. **Carex subfusca**, W. Boott in Wats. Bot. Cal. 2:234, Bailey, Proc. Am. Acad. 22:153.

Culms slender and erect, 3-5 dm. tall; leaves long-pointed, about 2 mm. wide, much shorter than the culms; spikes globose, 3-5 mm. thick, distinct, 5-7 in an ovoid head, 1-2 cm. long; scales brown, a little shorter than the perigynia, ovate, acute; perigynia ovoid, very obscurely nerved on the outer face, 2.5-3 mm. long, contracted to a serrulate beak as long as the body, the orifice merely toothed.

Cuyamaca Mts.: June, 1896; Brandegee. Borders of Cuyamaca reservoir, June, 1903; 3876 Abrams. Round Valley, 9,500 ft. alt., San Jacinto Mts., June, 1903; Hasse. Bear Valley, 6,500 ft. alt., June, 1894; 3772a Parish.

Plate XXIII. Fig. g.

✓ 38. **Carex festiva stricta**, Bailey, Mem. Torr. Club, 1:51.

Culms, unequal, slender, smooth, 2-9 dm. tall; leaves long-pointed, 2-4 mm. wide, shorter than the longer culms; spikes 5-9, ovoid, 3-5 mm. long, closely aggregated in a light brown, broadly ovoid or subglobose head, about 2 cm. long; scales as long as the perigynia and as broad, ovate-acuminate; perigynia narrowly ovoid, nerveless, or obscurely nerved on the outer face, serrulate to the base, 3.5-4 cm. long, narrowed to a beak one-half to one-third as long as the body.

San Jacinto Mts.: Dr. Hasse. Lake Surprise, 8,200 ft. alt., Aug., 1901; 2492 Hall. San Bernardino Mts., Bear Valley, 6,500 ft. alt., June, 1886, 1892, 1894; 1783, 2529, 3270 Parish. Northward in the Sierra Nevada to Oregon.

Plate 23. Fig. h.

≡ ≡ Bracts conspicuous, erect, green, aristate, scabrid, usually much surpassing the heads.

39. **Carex athrostachya**, Olney, Proc. Am. Acad. 7:393. W. Boott in Wats. Bot. Cal. 2:234. Bailey, Proc. Am. Acad. 22:153.

Culms erect, slender, scabridous under the heads, 2-5 dm. tall; leaves long-pointed, about 2 mm. wide, mostly shorter than the culms; spikes 5-15, light brown, ovoid, 3-7 mm. long, compacted in a globose or ovoid head, 1-1.5 cm. high; scales as long as the perigynia, brown, ovate-lanceolate, the midvein serrulate towards the acute or mucronulate tip; perigynia lanceolate to acutely deltoid, serrulate to the middle, nerveless, 3-4 mm. long, the flat beak about half the length of the body.

In wet meadows, Bear Valley, 6,500 ft. alt., in the San Bernardino Mts., Aug., 1882, June, 1894; 1573, 3271 Parish. North to British Columbia, and in the Rocky Mts. of Colorado and Montana.

Plate XXIII. Fig. i.

B U L L E T I N

O F T H E

Southern California Academy of Sciences

Committee on Publication:

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A. B. Ulrey

C O N T E N T S

Which Weighs Most, Egg or Chicken	59
A Visit to Rock Creek	60
Sun Heat	62
Flora of Clifton, A. I	67
Transactions	71

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Which Weighs the Most, the Egg or the Chicken which Comes From the Egg?

C. A. WHITING, SC. D., D. O.

This question has been guessed at a number of times, but I do not remember ever having seen exact data given in regard to the matter. With a view of answering the question with scientific exactness, Dr. J. O. Hunt, of Los Angeles, carried a fertilized and an unfertilized egg through the whole process of incubation with the results given below by the eggs indicated by A and C. More than a year after Dr. Hunt's experiments, I carried eggs B and D through the same treatment. The tabulated results are here presented.

Days.	A.	B.	C.	D.
1	.573 gr.	.590 gr.	.387 gr.	.552 gr.
2	.586	.603	.420	.586
3	.614	.608	.483	.563
4	.543	.601	.400	.574
5	.569	.594	.433	.583
6	.542	.602	.407	.356
7	.583	.593	.431	.394
8	.543	.595	.425	.399
9	.660	.599	.484	.400
10	.682	.594	.508	.409
11	.497	.714	.386	.658
12	.693	.693	.536	.649
13	.481	.654	.278	.603
14	.567	.633	.526	.559
15	.570	.622	.430	.587
16	.582	.601	.434	.503
17	.656	.594	.481	.501
18	.574	.602	.409	.409
19	.714	.604	.492	.386
20	.824	.603	.418	.351
21		.604		.309
22		.796		.250

Egg A weighed at beginning of incubation 59.76 g., and during the process of incubation lost 12.053 g., or a little more than 20 per cent.

Egg C, a sterile egg subjected to the same treatment, lost 8.768 g., or 15.5 per cent.

Egg B weighed at the beginning of incubation 62.842 g., and during the time of incubation lost 13.699 g., or 21.64 per cent. The chick hatched from the egg weighed 44.204 g., or 18.638 g. less than the egg before incubation, a loss of 29.65 per cent.

Egg D was so violently shaken previous to incubation that it was killed. Its treatment was the same otherwise as egg B. The loss of egg D during the time of incubation was 10.571 g., or a loss of 17 per cent.

A Visit to Rock Creek

*BY ANSTRUTHER DAVIDSON, C. M., M. D.

On May 30th, Dr. Hasse and I took the stage for Shoemakers' Ranch on Big Rock Creek, for a week's botanizing in the desert foothills. This creek lies about 30 miles east of Palmdale and drains a wide area on the northern slope of Mount San Antonio.

At this time most of the annual vegetation on the desert proper was dried out, but on the foothills above the 4,000 feet level many species were still in flower. From Shoemakers a good wagon road now runs up the creek to the Lowell Mine, 7,000 ft. alt., along this way most of our collecting was done. Among the specimens gathered were two new varieties and the following species hitherto reported as not found in Los Angeles county:

Eriophyllum confertiflorum lariflorum, Gray, was very common, the woolly fruited form of **Layia heterotricha**, H. & A. frequent; **Linanthus androsacus breviculus**, Milligan, the most common Gilia on the foothills; **Linanthus concinnus**, Milligan, at 7,000 ft. alt.; **Ribes cereum**, Dougl., **Quercus kelloggii**, Newb., and **Amelanchier alnifolia**, Nutt., at 6,000 ft.; **Collinsia callosa**, Parish, was common; **Pyrola rotundifolia bracteata**, Gray, and **Melica stricta**, Bol., were found among the pines; **Aira elongata**, Hook., at a lower altitude. **Chorizanthe perfoliata**, Gray, is fairly common; the common Brickellia is probably **B. Wrightii**, Gray. One plant of **Pholisma arenaria** was found by Dr. Hasse

*Read before Botanical Sect., Nov. 1, 1906.

a few miles out on the stage road. In Gray's Synoptical Flora this is said to be found from Monterey to San Diego and is said to be parasitic on the roots of Eriodictyon, clematis and oaks. A few years ago Prof. J. J. Rivers found some specimens in the sands where Ocean Park now stands. They appeared to him parasitic on the roots of **Croton californica**. The plant named **Enothera caespitosa** in my county list is **Enothera trichocalyx**, Nutt. A few specimens grow around Lancaster. **Montia spathulata**, Howell, once before found near Manzanita, a station equally far south, was here not infrequent about 4,000 ft. alt., and higher up among the pines we gathered a very marked form with characters almost sufficient to warrant a specific name.

✓ **Montia spathulata**, Howell, var. **viridis**, n. var. Diffuse, procumbent, dark green; basal leaves greatly expanded at the base of the petiole, broadly spathulate or lanceolate-ovate 1-4 in. wide above; cauline leaves 1 in. long, very broad sessile, deeply obovate for 1-3 its length; petals white or slightly pink 1.1-2 in. long; seeds as in the type. Readily recognized by its broad bracts, expanded petioles and dark green colour which it retains on drying. Type 1507. Hasse and Davidson in authors herbarium. Among pine woods 7,000 ft. alt., Big Rock Creek, Los Angeles County. Hall's 1245, June, 1899, near Old Baldy Mt.; and 2218, June, 1901, Onstatt's Valley, San Jacinto Mt., are evidently this same variety, though the cauline leaves are longer and less connate.

◁ Near the mine along with **Phacelia davidsoni**, were found a few plants of small flowered **Phacelia**, which I could not identify. Mr. H. H. Bartlett of the Gray Herbarium identified it as a variety of **P. humilis**, T. & G., and kindly forwarded a specimen gathered on Mt. Greyback, by W. G. Wright, in 1880, that is identical with mine.

✓ **Phacelia humilis**, T. & G., var. **lobata** n. var. Leaves all deeply lobed, the lower frequently pinnatifid, the calyx lobes linear spathulate; otherwise as in the type. Type 1491, Hasse and Davidson, June 7th, 1906, Lowell Mine, 7,000 ft. alt., Los Angeles County. Co-types of both varieties in Gray Herb., Cambridge.

◁ Besides the above, we found new habitats for some plants at present considered rare in our district, such as **Cercocarpus ledifolius**, **Senecio ionophyllus**, Greene; **Syntrichopappus lemmoni**, Gray; **Eremiastrum bellicides**, Gray, and **Cysopteris fragilis**, L. **Enothera rutila**, Davidson, supposedly rare and local, near Shoemakers' we found abundant on loamy

slopes on the creek and its tributaries. One tree of what may prove to be *Sambucus callicarpa*, Greene, was found.

SUN HEAT.

The following extracts are reprinted from the inaugural address of Professor John F. Lanneau, of Yake Forest College, North Carolina, on taking his seat as President of the Academy of North Carolina:

Facts in regard to the Sun's heat have been reached slowly because of peculiar difficulties due to the nature of heat.

It is not, as once held, the fourth form of elementary matter—earth, water, air, fire—nor yet, the subtile matter, "caloric", of a century ago. Indeed, though intimately associated with all forms of matter, heat itself is not matter.

It is force—energy—the force or energy of the constituent particles of either solids, liquids, or gases when the particles are in rapid motion—in minute, invisible, intense vibration. Matter may be opaque or transparent. We perceive its heat by the sense of touch. Heat is recognized not visually, but palpably. It is felt. As the feeling of warmth is the effect of the intense, invisible activity of the constituent particles of matter, so that of coldness results from their inactivity—their stillness.

Every hot body tends to coldness because its hedged-in multitudes of agitated particles, by the resistance of their recurring collisions, gradually settle toward rest.

Meanwhile, the molecular vibrations, imparted to the adjacent all-pervading ether, are transmitted radially to distant bodies, communicating vibratory motion to their particles. Thus a cold body may receive radiated heat from a distant hot body.

Air waves bring us the musical vibrations of a distant bell, and its pleasing sounds are reproduced in our aural nerves.

Ether waves bring us the vibrations of a distant hot body, and its heat is reproduced in our tactile nerves.

AMOUNT OF SUN'S HEAT.

The elder Herschel was the first to investigate the universe of stars and nebulae. His illustrious son in 1838 took the first well directed step in the study of the Sun's heat. A sunbeam of known section, imparting its heat to a definite weight of water, raising its temperature an observed number of degrees, in a certain length of time, gave the coveted fundamental

data: namely, the amount of heat received on a square foot of surface in one minute—taking as a unite of heat, the heat which raises a pound of water one degree Fahrenheit.

He found that the heat received at the Earth from the Sun in the zenith, is sufficient to melt an inch thick layer of ice in two hours and thirteen minutes. That is, if an inch thick shell of ice encompassed the Sun, distant from its center in all directions ninety-three million miles that immense, remote ice shell would all be melted in two hours and thirteen minutes.

With Young, our highest authority on solar facts, fancy such an inch thick shell of ice kept intact and drawn inward toward the sun, all the while containing the same quantity of ice, becoming thicker as it lessens in size. When it touches the Sun's surface its thickness will exceed one mile.

That vast, solid glacier, embracing the Sun, at every point over one mile high, would all be melted by the Sun's heat in two hours and thirteen minutes. It would melt a layer about forty feet thick each minute!

All honor to Herschel's conception and achievement. His method was perfect, but not his instruments. Better means now prove that the Sun radiates from its entire surface in one minute enough heat to melt encasing ice sixty-four feet thick!

Temperature of the Sun.

Within experimental limits Stephen's thermal law holds, namely that the rate of heat radiation is as the fourth power of the absolute temperature. Assuming it to hold universally, this law and the known rate of the Sun's radiation—500 thousand units of heat per minute from each square foot of solar surface—give as the Sun's surface temperature 12,000° F, about sixty times the temperature of boiling water!

With much more certainty, a lower limit to the Sun's surface temperature has been found experimentally. Scheiner by ingenious use of the spectroscope, comparing lines of the solar spectrum with certain lines of magnesium, proved that the photosphere is hotter than the electric arc—that is, that its temperature is certainly above 7000° F. So also, the heat at the focus of a powerful lens has furnished a lower limit in a very realistic way.

The Sun's rays received on a lens or burning-glass are converged to its focus, producing at that point a high temperature. A point out in space to which the Sun's rays naturally converge at an angle equal to the focusing angle of the lens, may be termed the space-point of equal temperature. Its distance from the Sun is easily found, for the ratio of that distance to the

focal length of the lens is the known ratio of the Sun's diameter to the lens' diameter.

At the focus of the largest lens yet constructed the high temperature produced instantly melted and vaporized the most refractory materials—platinum, fire-clay, carbon—everything tested. Its space-point of equal temperature is about two hundred fifty thousand miles from the Sun's surface—a little further from the Sun than the Moon is from us.

If then, our solid Earth were placed at that distance from the Sun—a quarter of a million miles—it would quickly melt, vaporize, vanish! That certainly is the temperature at one-fourth of a million miles from the Sun. Still higher is it at the Sun's surface—and inconceivably higher, the internal temperature.

Source of the Heat.

How does the Sun produce its enormous output of heat, and maintain its inconceivably high temperature? Of four theories to be considered—if the newest suggestion can be called a theory—only one is perfectly satisfactory.

1. The Cooling Theory.

It is certain the Sun is not simply an intensely hot body slowly cooling, for in that case, its materially lowered temperature after thousands of years of human history would have caused decided climatic changes, but we know that the vine the olive and the palm are fruitful now just where they flourished in the days of classic writers.

2. The Combustion Theory.

It is equally certain that the Sun is not simply burning up—that its heat does not result from ordinary combustion. As estimated by Young, its continuous great yield of heat could be produced by the consumption every hour of a layer of coal all over the Sun's surface nineteen feet deep. That is, by burning one ton of coal hourly on each square foot of the Sun's surface.

Lord Kelvin computes that were its vast mass solid coal environed by pure oxygen, and yielding its heat by combustion, it would be utterly consumed in five thousand years. It would then, have dwindled more than one-third since Ptolemy's day. Yet in the nearly two thousand years elapsed, it has certainly not diminished appreciably.

3. The Radium Theory.

Though not produced by combustion, the Sun's heat is now

surmised by some to be due largely if not entirely to radium—that most remarkable of known substances, discovered less than eight years ago by Mme. Curie. Proofs of its properties are ably presented in Rutherford's "Radio-Activity." It is not only self-luminous, but it is also self-heating, giving out every hour enough heat to melt more than its own weight of ice, a fourth more. It seems to be a very rare element. Tons of pitchblende yield only a few grains of radium. As radium evolves helium, and helium is known to be a chief component of the Sun's chromosphere, it is suggested that the Sun contains much radium.

Recall that the Sun radiates from its entire surface in one minute enough heat to melt encasing ice sixty-four feet thick. With this measure of the Sun's heat, and radium's heat emission per minute—melting one forty-eighth of its own weight of ice—as data, we readily find that the Sun's heat equals the heat emitted by a mass of pure radium weighing nearly as much as the whole Earth weighs. That much of this rare and peculiar element in the Sun—our world's weight of radium—would yield its known output of heat.

The surmise that such a quantity of radium is there, rather segregates the Sun from common matter. Moreover, the properties of radium are none too well known. At present therefore, attributing the Sun's heat to radium, is simply an interesting speculation.

4. The Mechanical Theory.

There remains for consideration the mechanical origin of solar heat—that is, the conversion of force, or the energy of moving matter into heat energy. There can be no doubt that many millions of meteoric bodies are hourly falling into the Sun. We know that something like twenty million so-called shooting stars plunge into our atmosphere daily. Their checked energy of motion reappears in the air as light and heat. But the heat thus imparted to our Earth in a year has been shown to be less than we receive from the Sun in one second! Incomparably more of such meteoric bodies are continually plunging into the solar atmosphere. Nevertheless, they must contribute comparatively little to the Sun's heat, for while interplanetary space, at least as far out as the Earth's orbit, is threaded by a veritable maze of meteoroids, if sufficiently more numerous throughout inner space to produce by their incessant impacts on the Sun a large part of its heat, the comparative density of the outlying myriads would affect perceptibly not

only the periodic comets but also the planet Mercury. No such effects have developed.

Helmholtz's theory of the mechanical origin of solar heat—his contraction theory announced in 1853—fully accounts for the Sun's heat. Recall that the inward pull of gravity at the Sun's surface is nearly twenty-eight times gravity at the Earth's surface. Abundant evidence furnished by the spectro-scope, and the Sun's known low density not much greater than that of water force the conclusion that the Sun is a vast sphere of commingling gases, among which many of our known vaporized terrestrial elements have been unmistakably indentified.

As the Sun contracts by its own powerful gravitation, the potential energy lost by gradual inward motion is replaced by equivalent heat energy. Every particle in the whole stupendous mass moving inward, contributes to the Sun's inconceivable aggregate of heat. Helmholtz computed that an annual contraction of two hundred feet in the Sun's diameter is sufficient to produce the heat it radiates. More accurate recent measurements of the amount of heat radiated, indicate a greater contraction—a lessening of the Sun's diameter by three hundred feet annually. This even, is so slight a change in that diameter of near a million miles that in seven thousand years will not appreciably alter the Sun's apparent breadth. Our present most exact heliometers could not then detect the change—a change in the Sun's angular breadth in seven thousand years of less than a single second! But as the Sun is a gaseous mass, its expanding force just counterbalanced by its gravitating force, it can contract only as its expanding force lessens by loss of heat radiated. Will it not then cool as it contracts? Not necessarily, for Lane's law, discovered about 1870, asserts the paradox that a globe of gas contracts by its own gravity and grows hotter, as necessary results of its loss of heat by radiation.

To illustrate:

Let v = volume of a globe of gas; p = its surface gravity, or pressure; and t = its absolute temperature. When from loss of heat by radiation its radius contracts one-half, let v' , p' , t' represent respectively its changed volume, pressure, and temperature. Since volumes compare as their radii cubed, and surfaces as radii squared, v' will equal $\frac{1}{8} v$, and the surface of v' will = $\frac{1}{4}$ the surface of v . Since surface gravity increases as the square of the radius diminishes, the inward pull or pressure on the surface of v' will = 4 times what it was on the surface of v ; and as

just shown, the surface of v' is only one-fourth that of v . Therefore, as a 4 times greater force will be exerted on a 4 times smaller surface, on a unit of surface the force or pressure on v' is 16 times the former pressure on v . That is, $p' = 16p$.

Moreover, Mariotte's well-known law requires that for a body of gas: The products of its volume and pressure changes as its temperature changes.

$$\begin{aligned} \text{Hence, } v \times p &: v' \times p' :: t : t', \\ \text{or, } v \times p &: \frac{1}{8}v \times 16p :: t : t', \\ \text{or } 1 &: 2 :: t : t', \\ \text{or } t' &= 2t. \end{aligned}$$

Thus, when contracted to half its radius the globe of gas is twice as hot as at the outset. In general, as it radiates heat it contracts, and as it contracts it grows hotter.

If, then, our Sun is truly gaseous from center to surface, notwithstanding its vast output of heat it must, by contraction, continually grow hotter. If however, as is likely, the photosphere of incandescent clouds of carbon droplets and the central density have made it partly viscous, or partly liquid or even semi-fluid, then the heat produced by contraction may just equal that lost by radiation. In this case, the Sun's temperature will be constant—as probably it has been during the historic past.

With increased condensation, the heat of contraction will fail to replace that lost by radiation, and the Sun's temperature will lower more until it becomes cold, solid, dark!

When by contraction its present diameter is reduced one-half, its density will be increased eight-fold. It will doubtless be non-gaseous and will be cooling. Contracting still, cooling more, radiating less and less heat, it must finally fail to support any of the present forms of terrestrial life—the world we know will be dead!

It is somewhat comforting to learn from Newcomb and other eminent authorities that this had failure of our now glorious Day-Star, when its generous heat and light shall be quenched—our world's night of death—is probably distant in the future some ten million years!

*Flora of Clifton, Arizona

ASCLEPIADACEÆ.

Philabertia cynanchoides, Gray. Common. July.

Asclepias mexicana, Cav. Duncan. July.

GENTIANACEÆ.

Erythræa calycosa, Buckley. Metcalf. Aug.

POLEMONIACEÆ.

Gilia longiflora, Gray. Common. May.
Gilia aurea, Nutt. Coronado m ne. May.
Gilia bigelovii, Gray. Fairly common. May.
Gilia floccosa, Gray. Ward's canyon. May.
Gilia polycladon, Torr. Sheldon. April.
Gilia inconspicua, Doug. Chase Creek. April.
Gilia leptomeria, Gray. Chase Creek. May.
Gilia aggregata, Spreng. Garfield.
Gilia multiflora, Nutt. Metcalf. Sept.
Phlox gracilis, Greene. Clifton. May.

CONVOLVULACEÆ.

Ipomea coccinea, L. Common. Sept.
Ipomea var. *hederifolia*, Gray. Sheldon.
Ipomea hederaceæ, Jacq. Not infrequent.
Ipomea costellata, Torr. Common on dry hills. Sept.
Convolvulus incanus, Vahl. Dry hills. Sept.
Euvolvulus argenteus, Pursh. Frequent.

SOLANACEÆ.

Solanum jamesii, Torr. Shady banks Blue River. Sept.
Solanum triflorum, Nutt. Clifton, rare. June.
Solanum nigrum, Clifton.
Solanum nigrum nodiflorum, Gray. Blue River. Sept.
Solanum xanti var. Parish. Metcalf. July.
Solanum eleagnifolium, Cav. Clifton, probably introduced.
Chamæsaracha coronopus, Gray. Dry mesas. April to Oct.
Chamæsaracha sordida, Gray. With the last but more common.
Physalis pubescens, L. Clifton.
Physalis crassifolia, Benth. Frequent.
Physalis longifolia, Nutt. Metcalf. Sept.
Margaranthus solanaceus, Schlecht. Above 4,000 ft. alt. Common. Sept.
Lycium berlandieri, Dunal. Common at higher altitudes.
Lycium pallidum, Miers. Common. April.
Lycium andersoni wrightii, Gray. Very common.
Datura meteloides, LC. Clifton.
Quincula lobata, Raf. Frequent. April.
Nicotiana attenuata, Torr. Common.

Nicotiana trigonophylla, Dunal. Common.

Petunia parviflora, Juss. Guthrie. April.

SCROPHULARIACEÆ.

Linaria canadensis, Dumont. Metcalf. May.

Maurandia wislizeni, Engelm. Not uncommon. Sept.

Scrophularia glabrata, Davidson. Common on Frisco and tributaries above 4,000 ft. Metcalf is the type locality.

Pentstemon acuminatus, Dougl. Guthrie April.

Pentstemon puniceus, Gray. Common above 4,000 ft. alt. April.

Pentstemon linarioides, Gray. Common on shaded rocks.

Pentstemon barbatus, Nutt. Metcalf and Blue River.

Mimulus rubellus, Gray. River sands. May.

Veronica peregrina, L. Frisco River. May.

Castilleia lanata, Gray. Tanner's canyon. May.

Castilleia integra, Gray. Dry mesas. Johnson's ranch.

Castilleia minor, Gray. Metcalf.

OROBANCHACEÆ.

Aphyllon fasciculatum, Gray. Coronado mine. May.

Aphyllon multiflorum, Gray. Metcalf. Lordsburg.

BIGNONACEÆ.

Chilopsis saligna, Don. Very common on the river banks.

PEDALIACEÆ.

Martynia fragrans, Lindl. On rich bottom lands; the fruit is a pest.

VERBENACEÆ.

Verbena canescens, HBK. In alkaline ground Hachita. Sept.

Verbena wrightii, Gray. Common on Duncan plains and frequently perennial. May.

Lippia wrightii, Gray. Stream banks above 4,000 ft. alt. Sept.

LABIATÆ.

Salvia romeriana, Scheele. North Clifton. April.

Salvia ballotæflora, Benth. Common on the higher streams. Sept.

Salvia lanceolata, Willd. Whipple meadow. Sept.

Salvia subincisa, Benth. Garfield. Sept.

Salvia coccinea, L. Common in mountain canyons.

Salvia davidsoni, Grenman. Stream bank about two miles above Metcalf. Only two plants were found. Oct.

- Trichostema arizonicum*, Gray. Chase Creek. Sept.
Pycnanthemum californicum, Torr. Garfield. Sept.
Monarda fistulosa mollis, Benth. Chase Creek. May.
Hedeoma thymoides, Gray. Well distributed. April.
Hedeoma thymoides oblongifolia, Gray. Frequent. Sept.
Hedeoma drummondii, Benth. Common. Sept.
Conoclinium intermedia, Gray. Metcalf. Sept.
Cedronella wrightii, Greenman. This is fairly common in its type locality about 4,000 ft. alt. on Chase Creek and Blue River. Sept.
Dracocephalum parviflorum, Nutt. Mountain stream banks. April.

NYCTAGINACEÆ.

- Mirabilis wrightiana*, Gray. Common above 4,000 ft. alt. Sept.
Mirabilis multiflora, Gray. Very common.
Allonia incarnata, L. Common.
Allonia linearifolia, Kuntze. Widely distributed.
Allonia linearifolia nyctaginia, Michx. Frequent. Sept.
Abronia turbinata, Torr. River sands, Guthrie. April.
Boerhaavia scandens, L. Common.
Selinocarpus chenopodicoides, Gray. Common on the Lordsburg plains.

POLYGONACEÆ.

- Polygonum nodosum*, L. Chinese gardens. Clifton.
Polygonum douglassii. Metcalf and Blue River.
Eriogonum abertianum, Torr. Frequent.

AMARANTHACEÆ.

- Froelichia interrupta*, Moq. Chase Creek. July.
Gomphrena cæspitosa, Torr. Chase Creek. April.
Amaranthus palmeri, Wats. Common.
Amaranthus fimbriata, Benth. Frequent.
Amaranthus blitoides, Wats. Coronado.

OFFICERS OF THE ACADEMY FOR THE YEAR, 1906-07.

- President, B. R. Baumgardt.
 First Vice President, J. D. Hooker.
 Second Vice President, Dr. A. Davidson.
 Secretary, Melville Dozier.
 Treasurer, S. J. Keese.

BOARD OF DIRECTORS.

- All the officers of the Academy and J. W. Badger, Geo. W. Parsons, Dr. C. A. Whiting, H. O. Collins, Wm. H. Knight, S. M. Woodbridge.

OFFICERS OF THE SECTIONS.

Astronomical.

Chairman, Wm. H. Knight.
Secretary, H. O. Collins.

Biological.

Chairman, Dr. C. A. Whiting.
Secretary, Dr. C. H. Phinney.

Geological.

Chairman, Geo. W. Parsons.
Secretary, G. Major Tabor.

Botanical.

Chairman, Dr. A. Davidson.

Agricultural and Chemical.

Chairman, Dr. S. M. Woodbridge.

Standing Committees.

Publication—Dozier, Davidson, Ulrey.
Program—Whiting, Knight, Collins.
Finance—Keese, Badger, Parsons.

TRANSACTIONS

Astronomical Section.

The regular meeting of the Astronomical Section was held Monday evening, October 15, 1906, at the residence of Prof. Melville Dozier, on Eleventh Street.

Mr. Knight read an interesting paper upon the newly discovered planet T. G., which was first detected upon a photograph plate at Konigstuhl on March 3, 1906, and seen through the refractor at Vienna on March 5, 1906, by Palisa.

Its orbit has a striking similarity with that of Eros, as it lies five gears within, and seven gears without the orbit of Jupiter.

HOLDRIDGE O. COLLINS, Secretary.

GEOLOGICAL SECTION:

The opening meeting of the Geological Section of the Academy of Sciences of Southern California was held at the Casa de Rosas Auditorium Girls Collegiate School, Adams and Hoover streets, on Monday, Oct. 22 at 8 p. m. An address was given by Professor W. L. Watts, his subject being Geological Notes on some portions of Oaxaca, Mexico. He described the geological features of the Northern and Central portions of Oaxaca, and their bearing on the mineral deposits of the territory which was the subject of his discourse.

He said that the portion of the Sierra Madre Oriental ranges which he visited in Oaxaca are composed mainly of hydro-mica schist with some ridges wherein the prevailing formation is syenitic granite, both the syenitic and schist are traversed by dykes of intrusive rock, and contain veins carrying silver and a little gold. The silver being principally in the form of pyrargarite, i. e., sulphantimonide of silver.

Mr. Watts regards portions of the Sierra Madre Oriental ranges as the oldest formations in Oaxaca.

The central portions of Oaxaca he found to be composed principally of granitic rocks showing a gneissic structure. These crystalline masses are overlaid by sedimentary and eruptive rocks. The granitic rock of this series contain veins of free milling gold ore, and in some places veins carrying copper, gold and silver are found.

Prof. Watts stated that in the Taviche District several mines of great merit are being developed, and that it is probable that the Taviche District will become one of the most important mining districts of Mexico. In this district the veins are fissure veins and veins of segregation and infiltration. The wall rock is andesetic lava. Professor Watts stated that it is quite likely that some of the veins would eventually be found to go down into the granitic rocks underlying the lava. A general discussion followed the close of the meeting and Professor Watts gave much interesting detail concerning his experiences, of 18 months in the heart of Mexico.

GEO. W. PARSONS, Chairman.

BIOLOGICAL SECTION.

The Biological Section of the Southern California Academy of Sciences held its first meeting of the year, in the Histological Laboratory of the Pacific College of Osteopathy. The meeting was called to order by the Chairman of the Section, Dr. C. A. Whiting, who made some announcements in regard to the coming meetings of the Section.

The minutes of the last meeting were read and approved.

Prof. L. H. Miller of the State Normal School was introduced and in a most interesting manner spoke of the structure and life history of a specimen of Salamander, *Autodax, lugubris*, found in Los Angeles. This animal is one of a species never before found south of the Tehachapi.

The talk was illustrated by a large number of fine pen drawings of the animal and its species at all stages of its development.

Twenty-three members and visitors were present.

No business being presented, the meeting was adjourned upon motion to meet at the regular time.

CARLE H. PHINNEY, Secretary.

The regular October meeting of the Biological Section of the Southern California Academy of Sciences, was held in the Histological Laboratory of The Pacific College of Osteopathy. The meeting was called to order by the Chairman of the section.

The minutes of the last meeting were read and approved.

The chairman called for voluntary reports upon scientific subjects. Dr. Whiting reported that this year marks the fiftieth anniversary of the discovery of coal-tar stains, and spoke of its influence upon the discoveries in biology and its great commercial value.

Prof. Ulrey was called as the speaker of the evening, who announced as his subject, "Some Problems of Inheritance." The talk was one of great interest and value. Prof. Ulrey suggested that inheritance depends upon the presence in the nucleus of the cell of zymogens; and that when the nature of proteid and the nature of zymogens are known, the problems of inheritance will be much more clear.

Questions were asked concerning some phases of inheritance which were discussed by several present. Twenty-five members and visitors were present. On motion the meeting was declared adjourned to meet at the regular time.

CARLE H. PHINNEY, Secretary.

MEETINGS OF THE BOARD OF DIRECTORS.

October 1, 1906.

The first regular meeting of the Board of Directors was held this evening at Symphony Hall. Present, Messrs. Knight, Parsons, Keese, Collins, Whiting, and Dozier. In the absence of the President, in Europe, Mr. Knight presided.

The result of the election of officers and appointment of committees was read and approved. The Treasurer gave a statement of the condition of the treasury, upon which the Secretary was instructed to request the collector of dues to furnish the Treasurer with a full and correct list of the members, together with their standing as to payment of dues. Other matters of interest were discussed without action, and the meeting adjourned.

MELVILLE DOZIER, Secretary.

November 5, 1906.

At the meeting of the Board of Directors this evening those present were Messrs. Knight, Collins, Parsons, Whiting, and Dozier. Mr. Knight presided. Mr. Ralph B. Clapp, of Alhambra, was proposed for membership, duly recommended, and upon motion was duly elected. There being no other business the meeting adjourned.

MELVILLE DOZIER, Secretary.

PROCEEDINGS OF THE ACADEMY.

Symphony Hall, October 1, 1906.

At the monthly meeting of the Academy this evening, Mr. Geo. W. Parsons presided by request. He announced the meetings of the several sections for the current month, and then introduced Mr. Wm. H. Knight, the speaker of the evening, whose topic was "The Panama Canal, the Plans Adopted and the Engineering Features." By means of maps and a carefully prepared paper, Mr. Knight gave in a very lucid form, the history, present status, and future outlook of this greatest of the world's enterprises; dwelling particularly upon the great significance of the large artificial lake to be constructed on the route, which will act as a safeguard against overflows and consequent damage in times of torrential rains, and also provide ample water for the operation of the locks.

MELVILLE DOZIER, Secretary.

Symphony Hall, November 5, 1906.

At the meeting of the Academy this evening the subject under discussion was "The Engineering and Commercial Features of San Pedro Harbor", presented in an address by Lieutenant Randolph Miner, U. S. N. The speaker was introduced by Chairman Wm. H. Knight in fitting terms and proceeded to describe the great work projected and now being accomplished at the harbor of San Pedro. The design is to construct a harbor of wide entrance, thoroughly protected from the ravages of storms from the southwest and the southeast, not less than forty feet deep at low water, and capable of accommodating two hundred and fifty ships at anchor.

The speaker entered into particulars, aided by charts, concerning the design, the cost, the capacity, the concessions to private and corporate parties, the progress and the possibilities of the great undertaking, and predicted a harbor of vast commercial value to the world, provided with ample facilities for loading and unloading, repairing, and constructing vessels of the largest type, bringing Los Angeles into direct touch with the great commercial centers of the world.

The address was replete with interest and elicited much discussion and questioning tending to elucidate still further this subject of such vital importance to this City and State.

A rising vote of thanks was heartily tendered to Lieutenant Miner for his valuable contribution to the knowledge and entertainment of the Academy.

MELVILLE DOZIER, Secretary.

ASTRONOMICAL SECTION.

The monthly meeting of the Astronomical Section was held at 825 West Eleventh street, on Monday evening, Nov. 19, 1906.

Professor Dozier read a paper on the "Sources of the Sun's Heat" by Prof. J. F. Lanneau, President of Wake Forest College, North Carolina, originally presented before the North Carolina Academy of Sciences at Raleigh on May 18, 1906.

HOLDRIDGE O. COLLINS, Secretary.

BOTANICAL SECTION.

The Botanical Section met at 544 Wilcox Building. Dr. Davidson read a paper and showed some specimens of plants gathered on a recent trip to the Mohave district

T. PAYNE, Secretary.

Southern California Academy
of Sciences

VOLUMES VI and VII

Table of Contents and Index

LIBRARY
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Contents of Volumes VI and VII

Volume VI contains two numbers; Volume VII has but one number.

All-Inclusiveness of Science	VII, 34
Ancestors of Our Whales <i>Prof. J. Z. Gilbert</i>	VII, 20
Celestial Measures	VII, 17
Constitution of Matter	VII, 35
Corporation, Officers, Fellows and Members.....	VI, 27; VII, 36
Diatoms..... <i>Sarah P. Monks</i>	VII, 12
Editorial Notes	VII, 3
Environment. Its Effect on Butterfly Forms... <i>J. R. Haskin</i>	VII, 5
Juglans Californica—Its Distribution... <i>Prof. W. L. Jepson</i>	VII, 23
Lord Kelvin	<i>Wm. H. Knight</i> VII, 25
Mars an Inhabited World..... <i>Wm. H. Knight</i>	VII, 7
Photograph of the Sun	<i>Prof. George E. Hale</i> VII, 18
Physics of Shooting Stars	<i>Prof. J. F. Lanneau</i> VI, 37
Porcupine, Grouse and Sparrow	<i>Dr. A. Davidson</i> VI, 36
Proceedings of the Academy.....	VI, 19, 29; VII, 27
Reports of Sections	VI, 22, 31; VII, 31
Some Ground-Dwelling Arachnida	<i>F. C. Luck</i> VI, 2
Squaring the Circle.....	<i>R. H. Chittenden</i> VI, 13
The Changes in Our Weeds.....	<i>Dr. A. Davidson</i> VI, 11
The Length of Jupiter's Day.....	<i>R. H. Chittenden</i> VI, 15
The Planet Jupiter	<i>Holdridge O. Collins</i> VI, 21
The Cycle Theory of Disturbances.....	VI, 16

Index to Volumes VI and VII



Arachnida	Vol. VI,	2
Arachnodiscus	Vol. VII,	14
Aulocodiscus	Vol. VII,	14
Bacillaria, paradoxa	Vol. VII,	15
Bromus rubens	Vol. VI,	2
Bromus maximus	Vol. VI,	2
Colias Eurytheme	Vol. VII,	5
Galinsoga parviflora	Vol. VI,	2
Grouse	Vol. VI,	36
Juglans californica	Vol. VII,	23
Juglans californica var Hind sii.....	Vol. VII,	24
Lactuca scariola	Vol. VI,	2
Mars	Vol. VII,	7
Phrynichidae	Vol. VI,	5
Porcupine	Vol. VI,	36
Salsola Kali-tragus	Vol. VI,	2
Solifugae	Vol. VI,	5
Sparrow, English	Vol. VI,	36
Sun photograph	Vol. VII,	18
Whales, fossil	Vol. VII,	20

BULLETIN

OF THE

Southern California Academy of Sciences

Committee on Publication:

M. Dozier A. Davidson, C. M., M. D. A. B. Ulrey

CONTENTS

On Some Ground-Dwelling Arachnida	2
The Changes in Our Weeds	11
Squaring the Circle	13
The Length of Jupiter's Day	15
The Cycle Theory of Disturbances	16
Proceedings of the Academy	19
Section Meetings	22

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On Some Ground-Dwelling Arachnida.*

By F. C. Luck, B. A., (Cantab.), F. R. M. S., Whittier, Cal.

Introduction. There are 5 orders of the class Arachnida which, owing to their nocturnal habits, and the consequent difficulty and inconvenience attending their study, have not received that general attention which they deserve. These interesting groups are: The Mygalomorphæ, or large tube-dwelling spiders; the Scorpions; the Uropygi, or whip-scorpions; the Solifugæ, or scorpion-spiders; and lastly the Amblypygi, which are comparatively rare, and have no popular name, though their extraordinary appearance, something between a spider and a bad dream, would make it an easy task to endow them with an appropriate title.

I studied these groups during a residence of eleven years in the East Indies, and subsequently had the advantage of working on the available material at the British Museum, under the guidance of Mr. Pocock, the European authority on the Arachnida. So, on arriving in Southern California, I naturally wished to study those representatives of the above-named orders peculiar to the Pacific Coast. Thanks to the courtesy of Mr. Lummis and of the staff of the Research department of the Public Library, I was put in touch with the national sources of information; only to discover that whilst Dr. McCook and Professor and Mrs. Peckham have dealt exhaustively with the American spinning-spiders, little has been published relating to the ground-dwelling Arachnida. True, I unearthed a paper by Mr. Nathan Banks, in which he names one species each of 2 genera of Solifugæ, and 3 out of the 4 genera of scorpions so far established in California. Of the others, no mention is made; and as the paper was evidently intended solely to identify material sent for that purpose, no description was appended which would enable the student to recognize such specimens as he might find.

It follows, therefore, that an open field is left for systematic work on these groups; and so I thought that a short epitome of their morphology and physiology might prove of interest to this society. It will, I hope, be found to be both accurate and intelligible, though neither too superficial nor needlessly technical. This paper is partly the result of a personal study of the Arachnida of other lands, partly an epitome of other workers' researches; and I offer it as merely a preliminary to detailed work on the Arachnida of Southern California.

*Read before the Biological Section of The Southern California Academy of Sciences, Feb. 18, 1907.

Morphology. The Arachnida are not insects, though often incorrectly spoken of as such; but may be defined as arthropodous (jointed) animals, in which the body is never composed of more than 18 somites or segments, and is divisible into 2 main regions—an anterior or cephalo-thorax, and a posterior or abdomen. The class comes between the Crustacæ and Hexarthra or insects, being distinguished from each by marked structural differences, yet having strong affinities to both.

The chief external differences between it and the Crustacæ are: the absence of a specialized auditory organ, the simplification of the mouth-parts, the modification of the gills into lung-sacs, and simple instead of compound eyes; whilst the swimming-telson of the lobster (for instance) becomes either a weapon, a harmless whip-tail, or is entirely absent.

The Arachnida may be distinguished from the true insects by the division of the body into two instead of into three main regions; by the presence of 8 instead of 6 legs, and the absence of antennæ. The eyes are simple instead of compound, there are no wings; and in most genera lung-sacs take the place of the tracheæ of the insect.

In this paper I omit the remaining orders of Arachnida, namely: the false or book-scorpions, the Opiliones or harvesters, and the Acari or ticks; nor do I deal with the orb-weaving spiders.

In the Arachnida we have a type of marked persistence of life, for there are but slight differences between fossil and recent Arachnida; and, since no advance in organization is indicated, persistence of habit may be inferred. These animals undergo no biogenetic changes, such as the larval and pupa stages of the insect. On the contrary, the individual is born in substantially the same form as that which characterizes its adult life; it merely increases in size by a series of moults. From this we infer that ages ago the Arachnida evolved those specific forms best ensuring survival; though naturally sufficient time has elapsed for them to have become specialized into many diverse forms.

The remote ancestor of the class was possibly one of the Chaetopoda, or bristle-footed worms; and the archetype may have been a creature, of which the nearest recent representative is that curious and lonely survival, the *Peripatus*, which is neither worm nor insect; and over whose classification a war has been waged among zoologists as bitter as the historic strife in microscopical circles, over the relation which the numerical aperture of the condenser should bear to that of the objective.

If by means of diagrams we represent the archetype of the Arachnida, and the specialized generic forms evolved there-

from, it will be easier to trace the connection existing between them, and the relation which they bear to the primal form and to each other.

Fig. 1. Represents the archetype—according to Messrs. Thorell and Pocock—an Arthropod with a body consisting of 18 somites; the anterior 6 of which are provided with large appendages for locomotion and grasping; having a cluster of median eyes, and a group of lateral eyes on each side. In recent Arachnida, the number of eyes varies from 2 to 8, differently disposed in the various genera. One species of whip-scorpion is eyeless; and a spider is found in the Mammoth cave in Kentucky, in which the eyes are completely atrophied. The head and thorax of the archetype are fused together. Each of the 6 succeeding somites bears a pair of small ventral appendages; these have become lost by the 6 posterior somites.

Now, it is obvious that this body was very unwieldy, and consequently ill-suited to the needs of a predaceous animal. By means of the succeeding diagrams it may be shown in detail how each order of the Arachnida have departed from and improved this useless body, so as to best suit the individual conditions of existence. And it will be of advantage to bear in mind that Evolution is as much a process of elimination, as of elaboration and addition.

Fig. 2. The Scorpions approach most closely to the original form; and in them the 5 unwieldy posterior somites become narrowed into the so-called "tail" (really a part of the abdomen), having at its end a post-anal sclerite or sting. The 4 posterior appendages of the 6 abdominal somites become merged into the stigmata of the lung-sacs; the second pair are modified into those curious organs of perception, the pectines or combs, which are peculiar to this group.

Fig. 3. In the Whip-tails (Uropygi), the whole abdomen is greatly reduced in length, and the 3 posterior somites are narrowed to support the multi-articulated, harmless telson or whip, corresponding to the "sting" of the scorpion and the swimming-plates of the lobster. A deep constriction separates the cephalothorax from the abdomen, and two of the lung-sacs disappear.

Fig. 4. In the Phrynichidæ (Amblypygi), the whole body is shortened into a kidney shape; the "tail" entirely disappears; and the scorpion's pincers are transformed into a pair of terrible grappling-hooks. The first pair of legs become very long and antenniform; and are no longer used as walking-legs, but as tactile organs, like the antennæ of insects. „ „

Fig. 5. In the Araneæ or true spiders, there is a deep constriction in the shape of a stalk or pedicel between the cephalo-

thorax and the abdomen; the pincers of the scorpion are modified into a pair of tactile palps; whilst the small mouth-pincers are elaborated into double-jointed fangs, having a poison-sac situated in the basal portion. The segmentation of the abdomen disappears in most genera, and the organ becomes soft. The abdominal appendages disappear, with the exception of the 2 last pairs, which, in this order only, become spinning mamillæ. Some spiders, like scorpions, breathe by means of lung-sacs, the higher forms by tracheal tubes.

Fig. 6. In the Solifugæ, or scorpion-spiders, the cephalothorax is divided into 3 somites; the abdomen approximates to the spider shape, and the telson is lost. The pincers become gripping-jaws, having their axes in a vertical instead of a horizontal plane.

Distribution. We come next to the distribution of the Arachnida. The Spiders are cosmopolitan, to as far north as Greenland and Spitzbergen.

The Scorpions are found in both hemispheres, between lines represented, roughly, by the 45th parallel of north latitude and the 47th parallel of south latitude.

The Whip-tails are found in the south of North America, Central and South America, in India, China, and Polynesia.

The Phrynichidæ occur in the same area of this continent as the preceding order, plus Patagonia; in Africa, India, China, and Polynesia. As might be expected from the topsy-turvy geology of Australasia, its scorpions differ greatly from those of the other regions, and are entirely absent from New Zealand. This absence, in view of the fact that they are found in all the other islands of the Polynesian archipelago, is one of the, as yet, unsolved problems of arachnology. Neither the whip-tails nor the Phrynichidæ are found in Australasia.

In North America, the northern limit of scorpions seems to be between the 35th and 40th parallels, on a line approximately bisecting this state and Virginia on the Atlantic coast. To this region has been given, for the purposes of taxonomy, the name of the Sonoran province of Merriam. In California, 4 genera have so far been established; namely—*Uroctonus*, *Hadrurus*, *Vejovis* and *Centrurus*. The whip-tails and Phrynichidæ have been found as far north as Lower California; and I am hopeful they may be found in favorable, that is, desert and sandy localities in Southern California. Of the Solifugæ, Mr. Banks names 2 genera as found in California, one of which together with 2 genera of scorpions, I have found at Whittier.

Physiology. We come now to the physiology of these Arachnida. As with all other animals, their life-activities are directed to 3 main ends: nutrition or offense, defense, and re-

production. To each of these aspects, in the order named, I invite your attention.

A glance at any of the Arachnida shows that they are as well equipped for a predatory career as a political "boss." The pincers and sting of the scorpion, the grappling-hooks of the Phrynichidæ, the jaws and pincers of the whip-tails and the scorpion-spiders, and the poison-fangs of the spider all serve the same end, namely, the securing of the various kinds of live food on which the different orders feed.

The sting and fangs of the scorpion and spider respectively are needed to enable them to secure such relatively powerful victims as cockroaches and large flies. The poison secreted seems to partake of the properties of snake-venom rather than those of insect poison. It does not appear to irritate the tissues, as, for example, does the sting of a bee; but, like the venom-peptone and venom-globulin of the snake, acts rather on the motor-centres through the circulation. And the cause of this difference may be found, if we consider the end in view in each case. The bee's sting is only needed to secure immunity from molestation, and to effect this purpose it need not be fatal; it suffices that irritation in greater or less degree should be caused. But the scorpion and spider need to secure a meal; therefore their poison must be able to at least paralyze their prey. It is interesting to watch the swift dart of the large Indian scorpion, *Palamnaeus*, on a cockroach. It catches the insect in its powerful pincers, leisurely (at least, such is the impression given) feels about with the sting till the right spot—usually the upper part of the thorax—is found, when the sting is firmly pressed, rather than struck, home; and the scorpion waits for the poison to take effect before beginning its meal.

The scorpions of Southern California are not nearly so large as many tropical varieties, some of which attain a length of 185 mm. or over $7\frac{1}{2}$ inches; but as a rule the effects of the sting of the smaller kinds are more poisonous than those of the larger.

The scorpion-spiders are strictly nocturnal in their habits, as their name *Solifugæ* indicates. They feed chiefly on ants, and hence do not need poison so much as activity, to enable them to secure their prey. Their speed is simply astounding, and they are by far the swiftest of all the Arachnida. They flit about like shadows, and for this reason it is no easy matter to secure them. Nor are they very common except in desert and sandy localities.

The Phrynichidæ are more sluggish than the preceding; and hunt in much the same fashion as does the toad. An insect will alight, apparently well out of range; but the extraordi-

narily long grappling hooks, usually carried well back in a line with the head, are shot out—like the toad's tongue—much further than would at first sight appear possible, and rarely miss their aim.

All the Arachnida, despite their preference (in many cases) for dry localities, must have water, or moisture in one form or another; and scorpions in particular are much more active after rain.

The appearance of these groups is undeniably repellent; and the remark is not seldom heard that, were a scorpion as big as an elephant, he would make existence impossible for all other forms of life. But most people either do not know, or else overlooks the fact that, whilst weight increases by cubes, strength increases by squares only. So that, in conformity with this law, if a scorpion were as big as an elephant, he would be crushed by his own weight, and—consequently—would be powerless to harm!

We may next consider the equipment of the Arachnida for defense. Their best protection lies in their powers of offense; still, they possess various defensive artifices. To some, Nature has given an appearance which alone says, "Hands off!" Others, like many insects, are protectively colored. Of such are some of the large oriental Mygalomorphæ, or so-called bird-eating spiders. These, on rearing up on the hind legs in a posture of defense, display a striking band of pale yellow or red on the under side of the fore part of the abdomen, which may serve as a danger-signal to warn off enemies. Others are imitative. Dr. McCook describes an American spider which resembles the excreta of birds; and nearly all of the order can simulate death, and keep up the deceit for a considerable time. In the East Indies I have seen a very small black spider which lives in the nests of a species of small black ant. These it resembles so closely, that only the minutest observation makes it possible to detect its real nature, which is revealed when the number of the legs is counted. So far as my observation goes, an example of true commensalism (or community of life) is here afforded, for ant and spider appear to live together in perfect amity, neither molesting the other. The trap-door spiders are, of course, protected by their tube, and by the difficulty of detecting the trap-door, which usually exactly imitates the immediate surroundings. The common Californian *Cteniza* can, moreover, keep her door shut from within, by anchoring her hind-legs to the lining of her tube, and by inserting the claws of the forelegs into notches in the lid or door; in which position she can offer a vigorous resistance to an intrusive knife-blade.

Some spiders and scorpions have the power of stridulation; the stridulating organ being composed of spines and clubshaped hairs, situated, in the spiders, between the fangs and the base of the palps; in the scorpions, between the pincers and the basal joint of the first pair of legs. In the case of an African scorpion (*Parabuthus*), the animal possesses the power of—as it were—playing the mandolin; which it does by striking the point of the sting along prominent striations or ridges situated on the keels of the first and second caudal segments. This sound, like the rattle of the snake, serves to warn enemies of the dangerous nature of the animal which produces it. It has been contended that this stridulation is in the nature of a sex-call; but this is a disputed point, and is at least open to question; since the *Arachnida* have no organ of hearing, such as is situated in the antennule of the lobster; or the tympanum which in some crickets is placed in the foreleg, in others above the insertion of the wing. Yet it seems that spiders are to some extent sensitive to vibrations of air or substance. I have, by striking the pavement as far as 3 feet off the largest of the Californian spiders, *Eurypelma* (commonly but incorrectly called the tarantula), obtained a response in the shape of the assumption of a defensive attitude. *Cteniza* will run up her tube and hold down the trapdoor, if the outside of it is gently scratched. And Dr. McCook has caused spiders to respond to the vibrations of a tuning fork. It is likely that this perceptive sense, in the absence of an auditory organ, resides in the setæ, or long specialized chitinous spines, seated in pits or depressions of the exo-skeleton. These differ in structure from true hairs, and are present, in greater or less degree, in all the orders under consideration. These different protective devices are needed by the *Arachnida*, in spite of their formidable weapons; for they have various enemies more powerful than themselves. Chief of these are (apart—of course—from birds) various species of wasps and flies. In California, the most conspicuous of these, by reason of its size and brilliant coloration, is the “tarantula-hawk”—*Pepsis formosa*—which attacks the *Eurypelma*, and also—I believe—the trap-door spider. Not the wasp, however, but its larva, feeds on the victim, which is paralyzed but not killed. An egg is then deposited on or in its body, which is then buried. The larva hatches out in due time, and feeds on the living but helpless body of its unwilling host. I had an opportunity of observing an attack made by *Pepsis* on an *Eurypelma*. The vigor and directness of the assault were remarkable; and the spider seemed to realize the hopelessness of resistance; for it huddled up helplessly, as does a rabbit when pursued by a ferret, and made no attempt to defend itself.

Paralysis appeared to follow immediately on the insertion of the sting.

On any warm summer morning a very active and brilliant blue wasp, not so large as *Pepsis*, may be seen hunting in the long grass for the *Lycosidæ* and smaller ground-spiders.

Thus even the well-armed spider, the terror of the insect world, and therefore the useful ally of man, has her conqueror: and such is the case throughout the insect world. I do not know, however, of any enemy that can subdue the repellent scorpion, except the aggressive black small boy, who will catch two of them and make them fight to the death, when he usually annihilates the survivor! And his elders sometimes make a sure-thing cure for sore eyes by suspending a live scorpion at the end of a string over a slow fire; and the scorched body is then applied to the affected organs.

As regards the reproduction of their species, the *Arachnida* offer perhaps the most interesting study of the mechanics of propagation to be found in the animal kingdom; and this has been exhaustively worked out by Professor and Mrs. Peckham. In this paper, however, I will only allude to one aspect of this important aim of their existence. Throughout the *Arachnida*, with hardly an exception, the male is considerably smaller and less powerful than the female. He is seldom more than 2-3 ds. her size, in some cases very much smaller. But his legs are longer in proportion to the size of the body than his mate's, hence he is the more active of the two. The reason of this is that the period of courtship is the most critical time of his life. To be successful in his suit, he needs the tact of a—Governor of Jamaica, and the speed of a Dan Patch in case he falls short in the former requisite. For should his advances be ill-timed, his more powerful spouse, being—like Socrates' wife—somewhat short-tempered, at once attacks him; and should he fail in speed, she solves in one operation the double problem of domestic supremacy and domestic economy, by killing and eating her luckless mate. Hence, being the smaller of the two, the male's only safety lies in superior activity, which is provided by the longer legs and lighter body.

It is worth noting, in taking leave of the subject, that though the orders which I have attempted to describe, as fully as possible in the limits of this paper, have not been very generally studied, yet the interest which the class as a whole has aroused in men of all epochs is remarkable. The spider-folk and their kin appear in the literature and folk-lore of many lands; from the classic and presumptuous *Arachne*—who gave her name to the *Arachnida*—and thus survives as an awful example, to the historic and somewhat one-sided partnership between King

Bruce and the spider. I have sometimes wondered if Bruce was grateful and considerate enough to avoid destroying, as he left the cave, the web of the wee animal whose industry was, though unconsciously on her part, the means of saving him from discovery and death. The scorpion has, of course, been immortalized in the Zodiac, and was even made to do duty as a double sign therein by the earlier Greek writers. It appears also on Assyrian astronomical cylinders.

Having tried to show, by description and diagram, how the various types of Arachnida have evolved their weapons from the primitive ancestral form, let me conclude by telling you how the ingenious Oriental accounts for the scorpion's sting. Thus runs the tale, as I heard it in Ceylon:

Whilst the lord Buddha sat one day in meditation under the sacred bo-tree, the scorpion—who was in those days stingless, appeared before him, complaining that for him life was unbearable; since his wife, the spider, had a sting in her mouth; whilst he, being weaponless, could not retaliate. He prayed, therefore, that Buddha the compassionate would arm his mouth in like manner. But the all-wise Buddha replied: "Not so; for with two poisoned mouths in a family, neither member could survive. Moreover, it is the nature of woman-kind ever to carry a sting under the tongue; but this is not so with the man, whose strength is in his body. Yet, for thy safeguarding, I give thee from henceforth a sting in thy tail; and learn thereby that, in a contest with thy wife, thy safety lies in turning thy back on her."

I will not assume, however, that the Oriental version is likely to be accepted in preference to the more prosaic explanation of Western science!

The Changes in Our Weeds.*

A. Davidson, M. D.

In March, 1893, the writer published some notes of "Erythrea" on the distribution and relative frequency of the immigrant plants in Los Angeles county. Nearly fourteen years have passed since then, and it is interesting to note the changes that have taken place among our weeds in this period of time. None of those then observed have become extinct; the relative frequency of the majority have remained unchanged. Some have increased in numbers, and a few new ones have appeared. Among those on the increase are *Melilotus alba* Lam. and *Cotula australis* Hook. *Bromus rubens* L. & *B. maximus* Desf. The former, rare and local at that time, has considerably increased in the original localities, and may now be found in scattered patches in many parts of the country. *Cotula Australis* Hook, then limited to a single locality at Sierra Madre, is now to be found in many moist shady places along the public streets of Los Angeles.

Bromus rubens & *B. Maximus* have much increased, and have extended their range to the foothills of the Mojave Desert.

The new weeds that have appeared since 1893 are, *Salsola Kali*, *tragus*, *Galinsoga parviflora*, *Lactuca scariola*, and *Piaropus crassipes*, Britton... *Salsola kali. tragus*, Linn., I first observed at Lancaster in 1893. It was then fairly abundant in the neighborhood, and rapidly spread over the country. The county supervisors have made a few spasmodic attempts to eradicate it, but it does not threaten to become a serious pest. *Galinsoga parviflora*, first discovered by F. Braunton at Vernon avenue in 1903, has rapidly extended along the irrigation ditches into the southwest of the city, but is not troublesome.

In the autumn of 1896 I found near University Station in this city two plants of *Lactuca scariola*, L., the prickly lettuce of Europe. That same season Mr. Braunton reported it from near Compton, where it was quite troublesome in one place. Since that time it has spread so rapidly that it may now be considered the most troublesome weed in this district. In luxuriance and density of growth it rivals the black mustard. On Sunset boulevard there is a large dense patch of mustard that has become invaded by the prickly lettuce, and I am interested in watching which will ultimately predominate. As the mustard attains its growth in the spring and the lettuce in the autumn, it is possible they may both continue to thrive together. Time will tell. Mr. S. B. Parish writes that he noted

*Read before the Botanical Section Feb. 14, 1907.

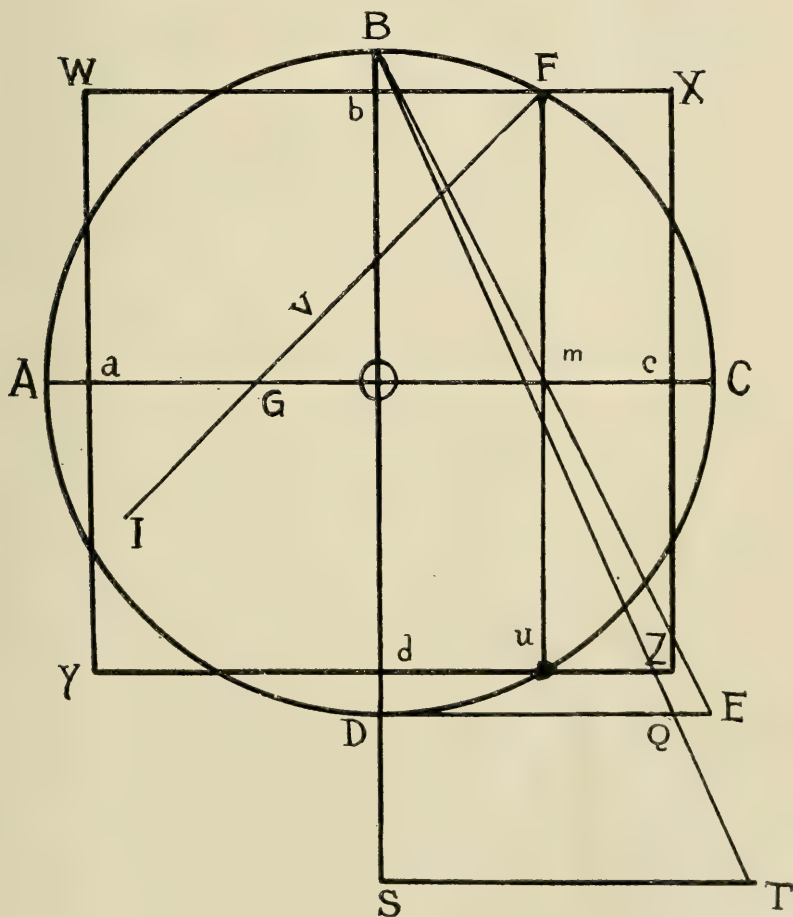
its first appearance in San Bernardino in 1895, and says it threatens there to be more troublesome than the mustard. This lettuce when eaten by cattle gives a disagreeable odor to the milk, to the great discomfort of the dairymen. On the other hand, it is a welcome food for poultry, turkeys being particularly fond of it. In 1904 I observed in some pools of the Los Angeles River near Hynes large quantities of the water hyacinth, **Piaropus crassipes**, Britton, the pest of the Florida rivers. Mrs. Lawrence has specimens from the San Gabriel River. This had evidently been established here for a few seasons before we discovered them. The heavy floods of this season have probably washed them away; the lack of water will prevent them ever being troublesome.

Squaring the Circle.

The Nearest Approximation, by R. H. Chittenden.

DIRECTIONS.

1. Divide the Circle, ABD , in quadrants by the diameters AOC and BOC .
2. Draw DE equal to and parallel to radius OC .
3. Draw DE , bisecting OC at m .
4. With C for a center and radius equal to OC , cut off the arc CF .
5. Draw Fm and make $Gm = Fm$.
6. Draw FG .



7. Produce B D to S making D S=O m.
8. Draw S T parallel to D E and equal to B m.
9. Draw B T, intersecting B T at Q.
10. Produce F G to I making G I equal to Q T.
11. Bisect F I at V and from the center O locate the points a, b, c, and d, making O a=O b=O c=O d=F V.
12. Through a, b, c, and d draw the sides of the square W X Y Z.

DEMONSTRATION.

Since F C is the arc of 60° , F m, the Sine of 60° equals

$$\text{radius} \times \frac{\sqrt{3}}{2}$$

Since G m equals F m and G m F being a right angle, F G

$$\text{equals radius} \times \frac{\sqrt{6}}{2}$$

Since D S is 1.5 of B S and the triangles S B T and D B Q are similar, Q T equals 1.5 of B T.

Since D E equals radius B E=radius $\times \sqrt{5}$ and S T equals $\frac{1}{2}$ of B E.

Hence B T equals $\frac{1}{2} \sqrt{30}$ and Q T= $1.10 \sqrt{30}$,

$$\text{Therefore F I equals radius} \times \left\{ \frac{\sqrt{6}}{2} \times \frac{\sqrt{30}}{10} \right\}$$

$$\frac{\sqrt{6}}{2} = 1.22474487$$

$$\frac{\sqrt{30}}{10} = .54772255$$

$$\text{Sum} = 1.77246742$$

$$\sqrt{3.1415926} = 1.77245385$$

$$\text{Difference} = .00001357$$

Since the area of a circle equals the product of the square of its radius and 3.1415926+ or P, it follows that when the radius is 1 the area=P, and the side of the required square $\sqrt{P}$. If the radius be any other number greater or less than 1, denoted by R, the side of the square is $R\sqrt{P}$.

The negligible difference, .00001357 for the length of the side of the square for the length for a 122 feet circle is **less than 1-100 of an inch.**

This method does not require the use of any instrument or mechanical device except a pair of compasses and a straight edge.

THEOREM.

The side of the square is the mean proportional between the arc of the quadrant and the diameter.

DEMONSTRATION.

When the radius is R. The area of the circle= R^2P and the side of the square= $R\sqrt{P}$.

$$\begin{array}{ccccccc} & & 2RP & & RP & & \\ & & 4 & & 2 & & \\ \text{The arc of the quadrant} & = & \frac{2RP}{4} & = & \frac{RP}{2} & \text{and} & \\ \text{Arc of } 90^\circ & & \text{Side} & & \text{Side} & & \text{Diameter} \\ \frac{RP}{2} & : & R\sqrt{P} & = & R\sqrt{P} & : & 2R \\ & & 2 & & & & \\ & & P & & & & \\ \text{or } \frac{P}{2} & : & \sqrt{P} & = & \sqrt{P} & : & 2 \end{array}$$

R. H. C.

The Length of Jupiter's Day.

Jupiter's axial rotation period according to Newcomb is 9 hours 55 min. 37 sec. (See Encyclopedia American).

Assuming that 92,996,000 miles is the true value of the astronomical unit.

The product of Jupiter's sidereal period mass and mean diameter is the length of his day. viz:

$$\begin{array}{ccccccc} \text{d.} & \text{mass.} & \text{diam.} & & \text{d. sidereal} & & \\ & 1 & 86552 & & & & \\ 4332.58 \times \frac{1}{1048} \times \frac{867450}{867450} \times 1.0027379 & = & .413623668 & = & & & \\ \text{h.} & \text{m.} & \text{sec.} & & & & \\ 9 & 55 & 37.08 & \text{sidereal time.} & & & \end{array}$$

Observe that in the foregoing equation the mass and mean diameter of Jupiter are expressed in solar terms.

Also that to reduce a time interval in mean solar time to sidereal time it is necessary to multiply by 1.0027379.

R. H. CHITTENDEN.

Urbita, Oct. 18, 1906.

The Cycle Theory of Disturbances.

About the year 1825 Heinrich Samuel Schwabe, an amateur astronomer of Dessau, Germany, began to observe and record sun-spots. He pursued his investigation for twenty-five years, and, in 1851, published the results of his labors. From the mass of data thus presented, a periodicity in sun-spot phenomena was first established. The subsequent investigations of Prof. R. Wolf of Zurich, and others confirmed the observations of Schwabe, fixing the period from maximum to maximum at approximately 11 1-9 years.

The cause of sun-spot phenomena has been studied with great care by De La Rue, Stewart and other investigators, who have promulgated theories assigning them to the influence of various planets in the solar system, or to the joint influence of several planets when in conjunction; but the theories thus proposed have not been accepted by the scientific world, because they were not considered as conclusively proven.

In 1850 Lamont, of Munich, called attention to the fact that there is a regular periodicity in the maxima of magnetic disturbances, as indicated by the variations of the needle, and fixed this period at 10 1-3 years. Subsequent investigations confirmed this theory.

Prof. C. A. Young, ["The Sun" p. 163] says: "As soon as Schwabe announced his discovery of the periodicity of the solar spots, Babine in England, Gautier in France, and Wolf in Switzerland, at once and independently perceived the coincidence between the spot-maxima and those of the magnetic oscillation. * * * The convincing evidence as to the reality of the asserted connection lies in the closeness with which, ever since we have been in possession of continuous and satisfactory observations, the magnetic curve copies that of the sun-spots. * * * From 1820 to 1895 the record is almost continuous, and the coincidence of the curves is such as to make it impossible to doubt the connection."

"When Loomis and other investigators came to collate observations of auroræ with those of sun-spots, they found an almost perfect parallelism between the curves of auroræ and sun-spot frequency."

The concurrence of maxima and general convariance of these three classes of phenomena—sun-spots, magnetic disturbances and **auroræ**—have thus been established to the satisfaction of the scientific world. Thus the disturbances in the gaseous envelope of the sun and the electric and magnetic phenomena pertaining to the earth are allied, either in the relation of cause

and effect or of concurrent phenomena assignable to the same cause.

Following the investigations of De La Rue and Stewart in their efforts to attribute the cause of sun-spots to the joint influence of various planets in the solar system, Prof. John H. Tice, Superintendent of Public Schools, of St. Louis, Mo., in 1862 took up this line of research, with the hope of discovering the cause of the 11-year sun-spot period and also of extending the inquiry to see whether there might be a similar periodicity in telluris and atmospheric disturbances. In other words, his hypothesis was that the same great cause lay behind sun-spots, magnetic and electrical disturbances, earthquakes, volcanic eruptions, hurricanes, tornadoes and atmospheric disturbances of all kinds.

This cause he assigned to the equinoctial disturbance proceeding from the various planets of the solar system. After an investigation extending through 12 years Prof. Tice, in 1875, published a treatise on Metrology, setting forth his theory and the results of his observation and research. This treatise, while challenging respectful consideration, is not presented in such a logical and well-digested manner as to be considered convincing testimony in support of his theory.

Therefore. It is a proper line of scientific inquiry to pursue this investigation, and ascertain, if possible, (a) Whether sun-spots are attributable to equinoctial disturbances in the several planets separately or jointly; (b) Whether there is a periodicity in earthquakes, volcanic eruptions, hurricanes, tornadoes and other disturbances, concurrent with the periodicity in sun-spots and magnetic and electrical phenomena.

In the year 1890 I obtained Prof. Tice's work on Metrology and was so much impressed with the theory therein set forth that, from data relative to the equinoxes of several planets, I prepared a chart showing the respective occurrences of such equinoxes from 1890 to 1902. By calculating the electro-magnetic intensity of the solar system for various years during this period it appeared that the year 1902 should bring disturbances of a pronounced character and that the year 1906 should be very extraordinary in this respect. In a paper read before the Teacher's Institute of Los Angeles, December 22nd, 1892, I gave an outline of the Tice theory, and made the following predictions:

"We may not expect to be entirely through with our series of extraordinary disturbances (those which occurred during the years 1891-1892) until about the end of the year 1896. There will be another period of storms and earthquakes, but not so violent or long continued as that we are now passing through, from 1901 to 1903 when Jupiter will have another equinox.

But when the earth reaches the year of grace 1906, it will need to gird up its loins and prepare for a severe visitation. Here you see the influence of the equinox of Saturn is not merged gradually into that of Jupiter as before, but is almost exactly superimposed upon that of Jupiter, and the other planets drop into line with their equinoxes, indicating that their disturbing influences will be united at their maximum in 1906, and the electric tension of our planetary system will be raised proportionately. Then, ladies and gentlemen if there is anything in this system of forecasts, **look out for disturbances of an extraordinary character.**''

The foregoing forecasts have been abundantly justified by the events. The year 1902 was one of considerable violence, (eruptions of Mt. Pelee, Soufriere and other disturbances) as predicted nearly nine years previously; the year 1906 has been one of extraordinary violence as predicted nearly fourteen years previously. The accuracy of these forecasts, made respectively nine and fourteen years before the events, challenges further investigation of the Tice theory, to ascertain whether it may not be well-founded and susceptible of conclusive proof.

Proceedings of the Academy.

Nov. 5th, 1906.

The Board of Directors met at 7:30 p.m., present, Messrs. Knight, Collins, Parsons, Whiting and Dozier. In the absence of the President Mr. Knight was chosen Chairman. The name of Ralph B. Clapp, of Alhambra, was proposed for membership in the Academy, being properly recommended he was duly elected after the transaction of routine business, the Directors adjourned for the discussion of the topic for the evening which was a presentation of the engineering and commercial features of San Pedro harbor, by Lieutenant Randolph Miner, U. S. N. The speaker was introduced by Chairman Knight in fitting terms, and proceeded to describe in detail the history and prosecution of the great work projected and now being accomplished at the harbor of San Pedro. The design of the government is to construct a capacious harbor of wide entrance, thoroughly protected from the ravages of storms; not less than forty feet deep at lowwater, and capable of accommodating two hundred and fifty ships at anchor. The speaker entered into particulars concerning the designs, the cost, the capacity, the concessions to make to corporate parties, the progress, and the possibilities of the great undertaking, and predicted a harbor of great commercial value to the world, provided with ample facilities for loading and unloading, repairing and constructing vessels of the largest type, bringing Los Angeles Angeles into direct touch with the great commercial centers of the world.

After the lecture, many questions were asked and answered relative to the subject under consideration, and a vote of thanks was enthusiastically extended to Lieut. Miner for his very lucid, full and valuable contributions to the Academy's knowledge of this important subject. The meeting then adjourned.

MELVILLE DOZIER, Secretary.

Dec. 3rd, 1906.

The Board of Directors met at the usual hour, Mr. Knight presiding and a quorum present.

Bills for the current expenses were prescribed and allowed. It was ordered that the method of collecting dues directly by the Treasurer shall go into effect January first. Messrs. Ezra Crossman and E. E. Eads, M. D., were duly elected to membership in the Academy on recommendation of Messrs. Britain and Whiting.

The Directors then adjourned to the discussion of the subject before the Academy, which was entitled "The Cycle Theory of Physical Disturbances," and which was most ably presented by Mr. Wm. A. Spalding a carefully prepared paper, a digest of which appears elsewhere in this Bulletin. After a general discussion of the subject matter the meeting adjourned.

MELVILLE DOZIER, Secretary.

January 7th, 1907.

After a brief meeting of the Directors this evening, during which only routine business was transacted, the Secretary introduced the speaker of the evening the President of the Academy, Mr. B. R. Baumgardt, who has recently returned from an extended tour of study and observation in Europe. Mr. Baumgardt, in his usual clear and forceful way, proceeded to give a running but corrected account of his most interesting and profitable travels.

In Norway the old "Viking Ship" was made the nucleus about

which clustered much of historic interest connected with the early history and development of that seafaring and hardy people.

In Sweden the astronomical observatories were objects of special interest. The observatory at Stockholm is equipped with somewhat antiquated instruments and suffers much inconveniences because of the brilliancy of the city's illumination at night. The observatory will probably be removed to a more suitable location.

In Stockholm is maintained at public expense an extensive outdoor museum where are exhibited and exemplified the manners and customs of the ancient Scandinavians; keeping the people in visual touch with the history and weapons of their country.

At the University of St. Petersburg is an exhibition the great mammoth, found encased in ice, in perfect preservation. The long and abundant coating of hair proves that it was intended for arctic habitation.

The faculty of this institution comprises men of great fame as mathematicians and scientific inventors.

The Astronomical observatory at Pulkov, Russia, is the best equipped in Europe, special attention being given to the determination of the parallax of the stars. Here was found a copy of the Bulletin of the Southern California Academy of Sciences. At Vienna the chief interest clusters about the lives and tombs of the great Musicians, such as Beethoven and Mozart.

In London, the Greenwich observatory was found to be well equipped, especially with men, there being more than sixty on the observatory staff. But the atmosphere is poorly adapted to astronomical work. The most delightful hours of the speaker's travels were spent in visiting the Royal Society and the Royal Astronomical Society, especially as he came into close touch with the life-work of the great Sir Isaac Newton. In Florentine history the most interesting figure is Galileo, where his villa, his tower, his telescope, his tomb, and his fame are sacredly guarded and revered.

Here, too, Bruno suffered death at the stake in 1600 for claiming a plurality of worlds.

After the Lecture the speaker responded to many questions from interested auditors, and the meeting adjourned.

MELVILLE DOZIER, Secretary.

February 4th, 1907.

At the regular meeting of the Directors this evening there were present Messrs. Baumgardt, Collins, Davidson, Keese and Dozier.

The ordinary bills were allowed and routine business transacted, whereupon the meeting adjourned to participate in the exercises before the Academy.

President Baumgardt appropriately introduced the speaker of the evening Prof. Rev. Ritchey of the Mount Wilson Observatory, whose mechanical skill and scientific knowledge are contributing so largely to the successful development of the great enterprise undertaken in our immediate vicinity. After giving an account of the difficulties that beset the construction of this most important observatory, especially that of conveying material to the top of the mountain, Prof. Ritchey explained and illustrated the method of preparing the great lenses for practical use after they have been cast, calling special attention to the vast possibilities that await the completion of the one-hundred-inch lens provided for by the magnificent gift of our Vice-President, Mr. John D. Hooker. The speaker then proceeded to speak of the comparative value of photographic and visual methods of observation in astronomy, the former

being specially adapted to long exposures of faint objects, while the latter served best in the observation of bright objects.

The stereopticon was then brought into use, and the glories of the heavens revealed in a way to entrance the soul and to overwhelm one with the realization of the infinite magnitude of God's creation. Suns, planets, satellites, starclusters, and nebulae, in all the grandeur of their brilliancy and infinitude, were thrown upon the screen and lucidly explained to the extreme delight and fascination of the audience.

Very many of the pictures were the result of Prof. Ritchey's own observation and development, and they rank among the best that can be found in the world. A vote of thanks was extended to the speaker for his instructive and uplifting address, and the meeting adjourned.

MELVILLE DOZIER, Secretary.

March 4th, 1907.

For the lack of a quorum present, no Directors' meeting was held this evening. In the absence of the President, The Secretary introduced the speaker of the evening, Dr. Holdridge O. Collins, who discussed the subject, "The Planet of Jupiter," in all of its phrases. The speaker said in part: "Of the eight planets circling our Sun, the great monitor is Jupiter. Great by reason of his immense bulk, his intense brilliancy, and above all by reason of the influence he has upon human life on our globe in furnishing the first certain means of measuring the velocity of light, and the longitude on exact location of places relative to each other.

His density is only one fourth that of the earth; and, were all the known planets assembled in one body, their combined mass would be only two-thirds of that Jupiter. His rotation is accomplished in about 9 hours and 56 minutes, while his revolution about the sun consumes 11 years and 314.92 days of our time.

Jupiter being inclined but a little more than three degrees to the plane of his ecliptic, the variation of seasons and in the length of day and night is exceedingly small; but as the mean density of Jupiter is nearly the same as that of the Sun, it seems not unnatural to suppose that the planet is intensely heated, and that this inherent heat is what produces great changes in its atmosphere. Another reason for believing Jupiter to be incandescent is that the light secured from him is far in excess of what he would reflect if his surface was like that of the Moon.

Jupiter therefore, cannot be the scene of animal or vegetable life. The conclusion may not be true of the four chief satellites of Jupiter, whose conditions may reasonably be compared to those of the four planets nearest to the Sun.

The late discoveries in the solar system have excited intense interest, and with the increase of power in new reflectors and refractors, this generation may come to some accepted conclusion as to the existence of life upon other worlds of our system.

The speaker went with minuteness into descriptions of Eros and its orbital peculiarities, and of the body "T. G." in its remarkable relations to the planet Jupiter, the entire lecture being replete with important facts and suggestive theories.

At the close of the lecture a brief discussion ensued. The Secretary read a statement from Chief Justice Melville W. Fuller, Chancellor of the Smithsonian Institution, announcing the appointment of Charles Doolittle Walcott, L. L. D. as Secretary of the Institution, to succeed the late Samuel Pierpont Langley.

The Secretary also read a communication from the International Zoological Association, writing the Academy to participate in the Seventh

Congress of the Association to be held in Boston, Mass. August 19th to 23rd 1907. The meeting then adjourned.

MELVILLE DOZIER, Secretary.

Section Meetings.

Los Angeles, Cal., Nov. 12, 1906.

The regular meeting of the biological section of The Southern California Academy of Sciences was held on the above date, in the Histological Laboratory of the Pacific College of Osteopathy. The meeting was called to order by the chairman.

The minutes of the last meeting were read and approved.

Dr. Whiting gave a short talk on the scope of the Academy and its work. In response to a call for voluntary reports upon scientific subjects, Dr. Whiting reported on the work of experimenting upon animal organisms and their relationship to disease.

Dr. Bebb of the Dental College was introduced as the speaker of the evening. Dr. Bebb spoke on the subject, "Teeth," illustrating his talk with some excellent lantern slides, showing the abnormal and normal dentition of both man and animals. In the course of his talk, Dr. Bebb said he expected the time to come, when a cause and a cure should be found for that most prevalent of all human maladies, Caries of the Teeth.

This most interesting and instructive talk was enjoyed by about thirty members and visitors.

After some discussion and questions, the meeting was adjourned.

CHARLES H. PHINNEY, Secretary.

Los Angeles, Dec. 10, 1906.

The December meeting of the biological section of the Southern California Academy of Sciences was held at the Pacific College of Osteopathy on Monday evening, December 10.

After the reading of the minutes of the previous meeting and regular business, Dr. Whiting spoke of the award of the Nobel prize.

Dr. E. L. Leonard gave the talk of the evening, taking as her subject "Immunity." All the forms of immunity were carefully reviewed and discussed, and especially the bearing of serum-therapy upon immunity. The taking of and the value of the Opsonic Index were fully discussed and explained.

A number of questions were asked Dr. Leonard and answered fully.

Fifty persons, members and visitors, were present.

CARLE H. PHINNEY, Secretary.

Los Angeles, Cal., Jan. 14, 1907.

The January meeting of the biological section of the Southern California Academy of Sciences was held at the Pacific College of Osteopathy, Monday evening, Jan. 14.

After the reading of minutes and announcements, Prof. Gilbert of the High School was introduced as the Speaker of the evening. Mr. Gilbert gave an extremely interesting talk on the Unicellular Organisms, illustrating the various forms with a large number of excellent lantern slides.

In spite of the very stormy evening, about thirty were present.

No business being presented, the meeting adjourned.

CARLE H. PHINNEY, Secretary.

Los Angeles, Cal., February 11, 1907.

The regular February meeting of the Biological Section of the Southern California Academy of Sciences was held on Monday evening, February 11, 1907.

After the regular routine of business, Mr. Fred C. Luck, a naturalist, whose home was for a number of years on the Island of Ceylon, was introduced as the speaker of the evening. Mr. Luck spoke on our native spiders. The lecture was most interesting, and was illustrated by a number of drawings made expressly for this meeting.

A large number of members and visitors were present.

C. H. PHINNEY, Secretary.

The Botanical Section met in the Wilcox Block February 14, 1907.

Dr. Davidson read some notes on the "Changes in Our Weeds."

Mrs. Lawrence showed a large number of plants from Arizona.

THEODORE PAYNE, Secretary.

The February meeting of the Astronomical Section was held on February 18, 1907 at the residence of Mr. B. R. Baumgardt.

Mr. William A. Spaulding read a paper upon "Periodicity in Terrestrial Disturbances Due to Cosmic Forces," which was an amplification of his late address before the Academy in Symphony Hall, and from which conclusions were drawn relating to the Seismic disturbances of 1906.

HOLDRIDGE O. COLLINS, Secretary.

BULLETIN

OF THE

Southern California Academy of Sciences

Committee on Publication:

Melville Dozier

A. Davidson, C. M., M. D.

Wm. H. Knight

CONTENTS

Officers of Corporation	-	-	-	-	-	-	27
Fellows and Life Members	-	-	-	-	-	-	27
Report of Secretary of Academy for year ending June '07	-	-	-	-	-	-	29
Report of Secretary of Astronomical Section	-	-	-	-	-	-	31
Report of Secretary of Biological Section	-	-	-	-	-	-	32
Report of Secretary of Botanical Section	-	-	-	-	-	-	32
Report of Secretary of Geological Section	-	-	-	-	-	-	33
Report of Treasurer of Academy	-	-	-	-	-	-	33
Flora of Clifton, Arizona	-	-	-	-	-	-	34
Physics of Shooting Stars	-	-	-	-	-	-	37

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Wilson Trail, in the heart of the Sierra Madre Mountains. On Mount Wilson is being constructed the largest

CORPORATION AND OFFICERS

The Academy of Sciences of Southern California has become an incorporated body under the laws of the State of California, and is legally entitled to all the rights and privileges and clothed with all the responsibilities that attach to public corporations in this State. It has done a noble work in the past in its more limited sphere. It is hoped that some of the ardent lovers of science in this favored clime will contribute of their wisdom and substance toward securing for the Academy a permanent home, where such a collection of scientific data, specimens and literature may be housed as will be a credit to Southern California and the scholarship it represents and fosters. Many donations of immense interest and of permanent value would be forthcoming if a suitable place were provided for their proper care and preservation. With such facilities for work as are appropriate, the Southern California Academy of Sciences would soon be recognized as among the most active and efficient instruments of popular instruction and moral influence in this community.

The following officers of the corporation were elected to serve during the first year, terminating June, 1908:

President—B. R. Baumgardt.

First Vice-President—Wm. H. Knight.

Second Vice-President—John D. Hooker.

Secretary—Melville Dozier.

Treasurer—Saml. J. Keese.

Other Directors—Holdridge O. Collins, Anstruther Davidson, George W. Parsons, G. Major Taber, John Vosburg, Clement A. Whiting.

The Board of Directors has adopted and had printed on very durable and substantial paper an appropriate form of "Certificate of Fellowship," to be properly signed and sealed and delivered to each member of the Academy upon whom has been or shall be conferred the degree of Fellow. The following is a complete list of Fellows of the Academy at the present date:

List of Fellows of the Academy.

Prof. Paul Arnold	Dr. Alfred Fellows
Dr. C. A. Bailey	Chas R. Fletcher
B. R. Baumgardt	Jas A. Foshay
Dr. H. M. Bishop	O. K. Goodwin
G. A. Bobrick	Dr. Jno. R. Haynes
C. B. Boothe	A. S. Hoyt
Prof. F. P. Brackett	Dr. West Hughes
Dr. Norman Bridge	John D. Hooker
Dr. F. D. Bullard	Dr. J. C. Hunt
W. A. Butterworth	Irving E. Ingraham
C. J. Callahan	Dr. J. H. Johnson
Wm. J. Canfield	Abbot Kinney
Dr. Edith J. Claypole	Wm. H. Knight
Holdridge O. Collins, LL.D.	A. H. Low
Dr. Anstruther Davidson	Malcolm Macleod
Dr. H. J. Davis	Dr. A. L. McLeish
Melville Dozier	Dr. F. C. E. Mattison

Prof. E. S. McClelland
Dr. J. D. Moody
Dr. J. C. Nevin
Geo. W. Parsons

W. C. Patterson
Dr. Theo B. Comstock
Mrs. T. A. Rendall
Paran F. Rice
Wm. L. Watts.

Life Members of the Academy.

Theodore B. Comstock

Wm. L. Watts

John D. Hooker

Reports of Officers

REPORT OF THE SECRETARY OF THE ACADEMY FOR THE YEAR 1906-07.

The Academy has made material progress during the year just closing, and has every indication of a brighter future than at any time in the past.

The following persons have been elected to membership during the year: Prof. James Stirling, F. W. Jones, Ralph B. Clapp, Ezra Crossman, E. E. Eads, Geo. W. Currier, Oswald Granicher, Dr. F. Clark, F. P. Brown, Dr. Chas. E. Case and J. R. Haskin. The present active membership of the Academy numbers about one hundred and sixty.

The meetings of the Academy during the year have been of more than usual interest and practical value, and have been attended by appreciative audiences.

At the October meeting Mr. Wm. H. Knight presented the plans and engineering features of the Panama Canal in a graphic and instructive lecture, illustrated by maps showing the work accomplished and to be accomplished in this greatest of the world's enterprises.

The November meeting was devoted to the consideration of the subject of San Pedro Harbor, so closely connected with the commercial expansion and future greatness of our city and section. The subject was most ably treated in an exhaustive lecture by Lieut. Randolph Miner, who went with much detail into the plan of operations, the design to be accomplished, the progress of the work, the cost already met and to be yet provided for, and the promise of development necessarily involved in the great undertaking. Lieut. Miner regards the San Pedro Harbor, when completed, as one of great commercial value to the world at large, provided with ample facilities for loading and unloading, repairing and constructing vessels of the largest type, and bringing Los Angeles into direct touch with the great commercial centers of the world.

The December meeting was given to the consideration of the "Cycle Theory of Physical Disturbances," most ably presented by Mr. Wm. A. Spalding in a lecture replete with thoughtful research and astronomical investigation. The speaker discussed with much clearness and erudition the relation between magnetic disturbances in the solar system and concurrence of planetary equinoxes, and called attention to the forecast he had made in 1892 to the effect that in the year 1906 the relative position of the planets would be such as to cause great magnetic and electrical tension, resulting in violent earthquakes in different parts of the world. The remarkable fulfillment of this prediction with such disastrous results in our own country and others gave added interest to Mr. Spalding's address, and the theory it was designed to elucidate.

At the January meeting the audience was entertained and enlightened by an interesting and instructive recital of observations and travel in Europe by the president of the Academy, Mr. B. R. Baumgardt, then just returned from a trip abroad. His remarks were devoted largely to matters of scientific interest in foreign lands, especially along the lines of astronomical research and progress.

The meeting in February was one of unusual richness in the impartation of knowledge and the fascinating interest of the subject presented.

Prof. R. W. Ritchie of the Mount Wilson Observatory, whose mechanical skill and scientific knowledge are contributing largely to the successful development of the great enterprise undertaken in our immediate vicinity, was the speaker of the evening, and his topic was the comparative value of photographic and visual methods of astronomical observation. During this clear cut and luminous presentation of facts the stereopticon was brought into use, and the glories of the heavens revealed in a way to entrance the soul, and to overwhelm one with the realization of the infinite magnitude and harmony of God's creation. Suns, planets, star clusters and nebulae, in all the grandeur of their brilliancy and infinitude, were thrown upon the screen, and lucidly explained, to the extreme delight and fascination of the audience.

During this lecture most gratifying reference was made to the marvelous possibilities anticipated by astronomers on the completion of the great one-hundred-inch lens, munificently provided for by Mr. John D. Hooker, the vice-president of the Academy; a matter which appeals intensely to the pride and gratification of the Academy.

The March meeting of the Academy was devoted to an address on the planet of Jupiter, by Mr. Holdridge O. Collins, LL.D., a member of the board of directors, and a valuable contributor to the highest interests of the Academy. The speaker discussed the giant planet of our system in all of its phases, entering minutely into the detail of its physical conditions, periodicity, influence and probable history, past and future. The lecture was full of practical and valuable information, and was greatly enjoyed.

The April meeting of the Academy was addressed by Dr. A. Davidson, also a member of the directorate, and for years the leading spirit in the Botanical Section of the Academy, choosing for his subject, "Early Man in Europe." The speaker made clear distinctions among the earliest races of men, the paleolithic, the neolithic, the Celtic, etc., and with the aid of the stereopticon presented evidences of man's development into a condition of civilization from a state of barbarism, and expressed the opinion that all real progress in civilization has emanated from those portions of the human family who have lived in tropical or semi-tropical climates, where men were not compelled to exhaust their energies and consume their time in procuring necessary food.

The May meeting of the Academy was given to a discussion of the topic now uppermost in the minds of our citizens, the Owens River aqueduct. The subject was presented by Mr. J. B. Lippincott, assistant chief engineer of the project, in a most interesting statement relative to the great undertaking, the country it will traverse, its viaduct, flumes, pipes, tunnels, manner of construction, and estimate of expenses. His discourse was illustrated with maps, charts, profiles and views along the region of its course, thrown upon the screen, and the explanations were supplemented by remarks from Mr. Wm. Mulholland, chief engineer, whose identification with the enterprise dates from its inception. Much interest in the subject was manifested by the audience. It was announced that the final meeting of the Academy for the season, to be held in June, would be addressed by President Baumgardt on "Russia and Her Scientific Men," and that a special program would be prepared for that occasion, to which admission would be by card only.

Since the May meeting a very important step has been taken in the history of the Academy by organizing it into an incorporated body,

with all the legal privileges and responsibilities that attend such an organization.

The members of the Academy in its former associational character have been made members of the Academy in its corporate capacity, and the Fellows of the Academy have been made Fellows of the new, with certificates of Fellowship, signed and sealed in proper form and ready for delivery to those entitled to them.

The following are the officers and directors of the corporate body: President, B. R. Baumgardt; First Vice-President, Wm. H. Knight; Second Vice-President, John D. Hooker; Secretary, Melville Dozier; Treasurer, Saml. J. Keese; Directors: Dr. A. Davidson, Geo. W. Parsons, G. Major Taber, Dr. C. A. Whiting, Holdridge O. Collins and John Vosburg.

For the legal services necessary to effect this change, carefully and gratuitously given, the Academy is indebted to Mr. H. O. Collins, of its Board of Directors.

In its efforts to popularize scientific investigation, we bespeak for the Academy the confidence and co-operation of the citizens of our fair city.

MELVILLE DOZIER, Secretary.

ASTRONOMICAL SECTION.

To the Academy: I have the honor to report the proceedings of the Astronomical Section for the current year, 1906-1907:

There have been six meetings, at all of which valuable papers were presented, and at which the members generally participated in interesting discussions.

On May 21, 1906, the chairman, Mr. Wm. H. Knight, tendered some reflections upon "Cosmic Influences in the Production of Earthquakes," suggested by the late terrestrial disturbances in San Francisco, and the predictions of several years ago by Mr. William A. Spalding of this Academy.

October 15, 1906, Mr. Knight presented all the known facts concerning the newly discovered asteroid, T. G., which was first detected upon a photographic plate at Königstuhl on March 3, 1906, and seen March 5, 1906, through the refractor at Vienna by Palisa.

November 19, 1906, Prof. Dozier read a paper on the "Sources of the Sun's Heat," by Prof. John F. Lanneau of Wake Forest College, North Carolina, originally presented May 18, 1906, before the North Carolina Academy of Sciences.

In view of the approaching close opposition of Mars, Mr. Knight read a most interesting paper upon that planet at the meeting of January 21, 1907. This article was subsequently published in full by the Los Angeles Times.

At the meeting of February 18, 1907, Mr. William A. Spalding delivered a lecture upon "Periodicity in Terrestrial Disturbances, due to Cosmic Forces," which was an amplification of his address before the Academy in Symphony Hall, and from which conclusions were drawn relating to the seismic disturbances of 1906.

On April 15, 1907, Prof. Dozier read an article on "Physics of the Shooting stars," by Prof. Lanneau of Wake Forest College, North Carolina.

No meetings of the section were held in the months of June and December, 1906, nor in May, 1907. Very great interest has been taken in the working of this section during the last year, in view of the late remarkable discoveries, and the eminent astronomers at the Lick

and Harvard observatories have most cheerfully and generously responded to our communications. We hope to secure from Prof. William Hammond Wright of Lick Observatory a paper upon Eros, which asteroid he has been studying during the last two years from the observatory in the Andes of Chile, where he was sent by the State University for this work.

The Academy has been presented with a very valuable refractor of 4½ inches objective, which is now in the possession of this section, and with which much good work has been done, and it will be in use by members during the opposition in July of Mars.

Respectfully submitted,

HOLDRIDGE O. COLLINS,

Secretary of the Astronomical Section.

Los Angeles, Cal., June 5, 1907.

BIOLOGICAL SECTION.

The interest shown in the affairs of this section of the Academy has been very gratifying to its members. Ten successful regular meetings have been held during the past year, which must be understood to exclude July and August. The average attendance at the meetings has been about twenty-five persons, including visitors. The speakers have been:

Prof. E. R. Miller of the Normal School.

Prof. Ulrey of the University of Southern California.

Dr. Bebb of the Dental College.

Dr. E. L. Leonard, City Bacteriologist.

Prof. Gilbert of the High School.

Mr. Fred C. Luck of Whittier.

Dr. C. A. Whiting, the chairman of the section, and

Prof. N. C. Gardiner of the Polytechnic High School.

Among the subjects have been the following:

The Life History of the Salamander, *Ambystoma*.

Some Problems of Inheritance.

Teeth.

Immunity.

The Reptiles of Los Angeles County.

The Unicellular Organism.

The Native Spiders.

The Physiology of the Cell.

This series of lectures has aroused an interest and called out an attendance which entitles the Biological Section to take a high rank as a scientific association.

At the May meeting the officers for the past year were re-elected, and the prospects for another year of good work seem bright.

C. A. WHITING, Chairman.

BOTANICAL SECTION.

The Botanical Section has held three meetings this season, all of which have been chiefly devoted to the examination and determination of herbarium specimens from California and Arizona.

Two papers have been formally read, viz: "A trip to Rock Creek," and "Some Changes in Our Weeds."

As the result of the season's work, two new specimens have been

added to the flora of North America, and fifteen new records made for the county of Los Angeles.

A. DAVIDSON, Chairman.

GEOLOGICAL SECTION.

Our first section meeting was held in October in the auditorium of the Girls' Collegiate School, Adams and Figueroa streets. Prof. W. L. Watts, well known in mining and oil circles throughout the State, gave us a very entertaining and thoughtful talk on some of the geological conditions of Southern Mexico, illustrated with maps and photographs. Different phases of the life in that part of the world were also portrayed, and all was highly appreciated.

On November 26 Dr. Koebig, former city chemist, gave us a very interesting lecture on "Cement Deposits," at the State Normal School.

Prof. Spalding's "Cyclic Phenomena," in December, took the place of a section meeting for that month. Since the first of the year there has been much faulting along our geological structural lines, and much irregularity is apparent in the general formation, not caused by quakes and rock slidings, but by the enforced absence of the chairman of the section in Mexico on private business, and in Nevada under a commission from our Chamber of Commerce to report on the mining and general conditions of the territory tributary to the metropolis of California, Los Angeles city.

GEO. W. PARSONS, Chairman.

Report of the Cash Receipts and Expenditures for the SOUTHERN CALIFORNIA ACADEMY OF SCIENCES, For the Year Ending June 5, 1907.

Balance on hand June 25, 1906.....	\$ 28.62
Collections, dues from members	456.00
Donation from Mr. J. D. Hooker.....	120.00

Total Receipts	\$604.62
Total Disbursements	535.89

Balance cash on hand	\$ 68.73
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S. J. KEESE, Treasurer.

Los Angeles, Cal., June 5, 1907.

Flora of Clifton, Arizona

By A. Davidson, M.D.

Compositae.

- Hoffmeisteria pluriseta*, Gray. River canyons.
Eupatorium pauperculum, Gray. Shady rocks. Common.
Carminatia tenuiflora, D. C. Shady places above 4000 ft. alt.
Kuhnia rosmarinifolia, Vent. Blue River, Sept.
Brickellia atractyloides, Gray. Frequent.
Brickellia coulteri, Gray. Mesas; May.
Brickellia wrightii, Gray. Frequent; October.
Brickellia Baccaridea, Gray. Very common; October.
Brickellia wislizeni, Gray. Dry washes, Metcalf; October.
Brickellia betonicaefolia, Gray. Coronado mine, September.
Brickellia brachyphylla, Gray. Mesas; October.
Carphochaete bigelovia, Gray. Chase Creek, April.
Gymnosperma corybosum, D. C. River bottom; September.
Gutierrezia lucida, Greene. Common, September.
Grindelia arizonica, Gray. River bottom.
Heterotheca subaxillaris, Lam. Frequent.
Chrysopsis hispida, Nutt. Common.
Chrysopsis canescens, D. C. Blue River.
Aplopappus laricifolius, Gray. Common; September.
Eriocarpum gracilis, Greene. Common.
Bigelovia, graveolens, Gray. Sheldon.
Solidago bigelovii, Gray. Blue River; September.
Solidago californica, Nutt. Common.
Aphanostephus arizonicus, Gray. Gila and Frisco Rivers; April.
Townsendia fendleri, Gray. Gila River; May.
Aster spinosus, Benth. Common.
Aster commutatus, Gray. Canyons, Frisco River; April.
Aster canescens latifolius, Gray. Frequent.
Aster tanacetifolius, H. B. K. Common.
Erigeron subdecurrens, Schultz. Duncan.
Erigeron neo-mexicana, Gray. Metcalf.
Erigeron canadense L, Duncan.
Conyza coulteri tenuisecta, Gray. Above Metcalf.
Baccharis emoryi, Gran. Duncan.
Baccharis sarothroides, Gray. Metcalf; October.
Baccharis pteronoides, D. C. Coronado Mine; May.
Baccharis thesioides, B. B. K. Coronado Mine; October.
Baccharis viminea, D. C. Common.
Gnaphalium sprengelii, H. & A. Chase Creek.

- Gnaphalium leucocephalum**, Gray. Chase Chase.
Melampodium cinerum, Gray. Frequent.
Parthenium incanum, H. B. K. Above Metcalf.
Iva dealbata, Gray. Hachita, N. M.
Iva ambrosiaefolia, Gray. Generally distributed.
Ambrosia aptera, D. C. Duncan.
Zinnia anomala, Gray. Hachita, N. M.; September.
Zinnia grandiflora, Nutt. Common.
Zinnia pumila, Gray. Frequent.
Sanvitalia aberti, Gray. Shady ground above 4000 ft. alt.
Eclipta alba, Hass. Duncan.
Gymnolomia multiflora hispida, Greene. Chase Creek.
Viguiera helianthoides, H. B. K. Blue River; September.
Encelia farinosa, Gray. Frequent.
Encelia frutescens, Gray. Dry banks.
Verbesina rothrockii, Rob. & G. Hachita, N. M.; Sept.
Verbesina encelioides, B. & H. Common.
Bidens bipinnata, L. Above Metcalf.
Heterospermum pinnatum, Gray. Garfield, Blue River.
Layia elegans, T. & G. Common.
Baileya multiradiata, H. & G. Very common.
Laphamia ambrosioefolia, Greene. In clefts of sandstone rock,
 just south of Clifton; September.
Eriophyllum lanosum, Gray. Clifton.
Bahia absinthifolia dealbata, Gray. LL.
Bahia chrysanthemoides, Gray. Dry washes.
Hymenothrix wislizeni, Gray. Rocks near Duncan.
Hymenothrix wrightii, Gray. Frisco River, Clifton.
Hymenopappus flavescens. Ward's Canyon.
Chenactis carphoclinia, Gray. Common.
Picradenia davidsoni, Greene. Common, on Frisco and Gila
 River sands. Type locality, April.
Gaillardia pulchella, Foug. Frequent.
Flaveria repanda, Lag. Duncan.
Pectis prostrata, Cav. Sheldon; September.
Pectis angustifolia, Torr. Common; September.
Pectis filipes, Gray. Metcalf; September.
Pectis longipes, Gray. Metcalf; May.
Artemesia ludoviciana, Nutt. Frequent.
Artemesia mexicana, Willd. Common.
Bebbia juncea, Greene. River canyons.
Senecio Neo-mexicanus, Gray. Common.
Senecio eremophilus, Richards. Tanner's Canyon; November.
Senecio douglasii, D. C. Common.
Senecio parryi, Gray. Metcalf and Blue Rivers; September.

Cnicus neo-mexicana, Gray. Metcalf; September.
Perezia wrightii, Gray. Longfellow.
Perezia nana, Gray. Ward's Canyon; May.
Trixis angustifolia, D. C. Chase Creek; October.
Stephanomeria runciata, Nutt. Common.
Stephanomeria thurberi, Gray. Blue River.
Microseris linearifolia, Gray. Common.
Malacothrix sonchoides, H. G. Common.
Malacoth. fendleri, Gray. Common.
Malacoth. glabrata, Gray. Common.
Calycoseris wrightii, Gray. Common.
Lactuca ludoviciana, D. C. Blue River.
Aster erecoides, L. Frequent.
Aster multiflorus, Ait. Duncan. Metcalf.

Porcupine, Grouse and Sparrow

While Dr. Hasse and I were botanizing in the Tehachapi Mountains in the first week of June, this year. We flushed a solitary grouse on the slopes of Mt. Tehachapi about 6000 feet altitude. Dr. Minney of the Pine Tree Mining Company informs me that one of the workmen shot two grouse near there last winter. This bird, probably the common grouse of the Sierra Nevadas, must be rare so far south, as I have never before seen it in my many wanderings in the San Bernardino Range. Near the mining camp Dr. Minney has frequently seen a lone porcupine, another rare mammal in this country. Stephens (Mammals of S. Cal.) reports its having been seen in the San Bernardino Mountains in 1903.

The common English sparrow has reached Lancaster on the Mohave Desert. We saw two pairs there last year. It may soon reach Los Angeles.

A. DAVIDSON.

PHYSICS OF THE SHOOTING STARS

J. F. Lanneau, Prof. Math. & Science, Wake Forest College, N.C.

Everyone is familiar with the suddenly bright, star-like objects which swiftly and silently dart here and there in the evening sky every few minutes. These transient and seemingly erratic meteors are popularly known as shooting stars.

In Ptolemy's *Almagest*—written in the second century of our era, the authoritative text on astronomy for fourteen hundred years, taught once even in Harvard and Yale—there was no mention whatever of shooting stars. They were held to be mere exhalations from the earth—of no concern to an astronomer. But found to be truly celestial bodies, their study has become in recent years a specialty with some astronomers.

By physics of a shooting star is meant such facts as its height above the earth, its distance from the observer, its mass or weight, and other seemingly unattainable knowledge concerning it.

It is proposed to show in outline how such knowledge may be gained.

Height, Distance, Velocity

Two observers—one say near Wake Forest and one thirty-five miles due south, near Selma—agree to watch the western sky every fair evening until nine o'clock. Many of the little meteors carefully noted by one of the watchers are not observed by the other.

One evening however, as subsequently shown by comparing records, they both note the same shooting star seen to pass from the point *s* to the point *s'*, Fig. 1.

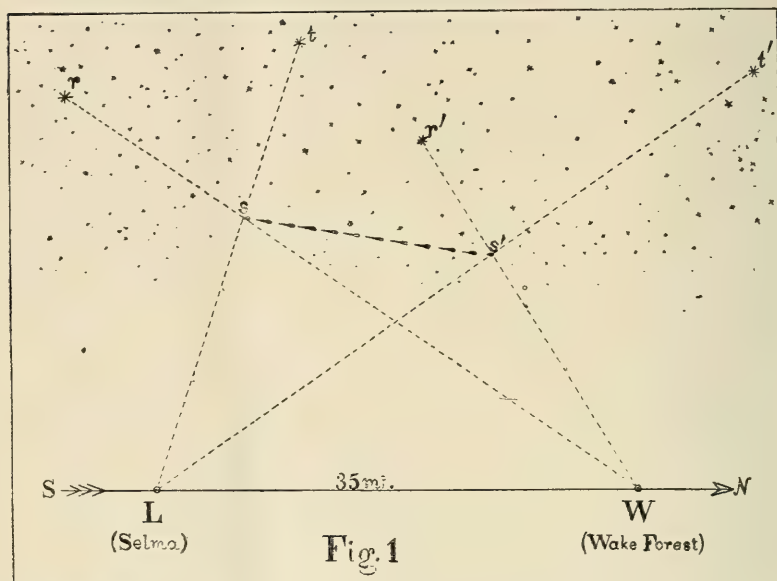
Each observer counts rapidly while it shoots from *s* to *s'*. At the same time he notices the particular fixed stars nearest in line with its appearance and disappearance at *s* and *s'*—the stars at *r* and *r'* as seen from *W*, and the stars *t* and *t'* as seen from *L*. This much quickly done, each looks at his watch to see the hour and minute of the occurrence. Then, by several repetitions of his rapid count, watch in hand, he finds the number of seconds in the transit from *s* to *s'*.

Their records, say, are :

—At L—		—At W—	
Count	23; Time, 5½ sec.	Count	26; Time, 6½ sec.
From	Castor, (star beyond <i>s</i>)	From	α Hydra, (star beyond <i>s</i>)
To	Capella, (star beyond <i>s'</i>)	To	Procyon, (star beyond <i>s'</i>)
Date	May 1 '05, 8:30 o'clock p. m.	Date	May 1 '05, 8:29 o'clock p. m.

The two sets of notes agree substantially, as they should, in

the number of seconds of the shoot from s to s' and in the hour and minute of the observations. They differ, of course, as to the stars in the lines of sight from stations thirty-five miles apart. The averages of the time from s to s' and of the time



of observation, as noted, are taken as correct; 6 seconds as the time of transit and 8 hours 29 minutes 30 seconds as the time of observation.

These simple observations are sufficient. The rest is matter of calculation aided by data taken from the American Ephemeris, a government publication based on the work of the National Observatory at Washington.

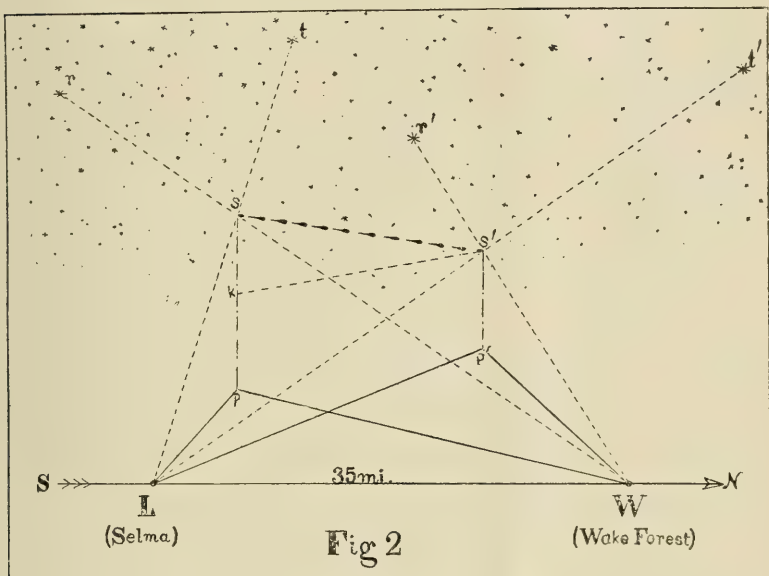
Skilful use of the data for Castor and Capella, α Hydræ and Procyon, gives the directions of those particular stars as seen from L and W at 29 minutes and 30 seconds past 8 o'clock on the evening of May 1; that is, the directions of s and s' from L, and their directions from W.

In Fig. 2, p and p' are points on the earth vertically under s and s' . The directions found by calculation as just stated, are: for s , its angles of elevation pLs and pWs , also its horizontal bearings, the angles pLs and pWs ; and for s' the like angles $p'Ws'$, $p'Ws'$, $p'LS$ and $p'WS$. Obviously, this gives all the angles of each of the three triangles which meet at p and of the three which meet at p' . And since one side, LW , is 35

miles, all the other sides in each of the six triangles can be calculated.

We thus find ps the shooting star's height when first seen, Ws its distance from W and Ls its distance from L ; also $p's'$ its height at the moment of extinction, and Ws' and Ls' its distances at that moment from W and L .

The line $s'k$ is drawn parallel to line $p'p$, omitted in the figure. Triangle $p'pL$ gives the length of $p'p$ and therefore of its equal $s'k$. Right triangle $s'ks$ gives length of ss' . This length was



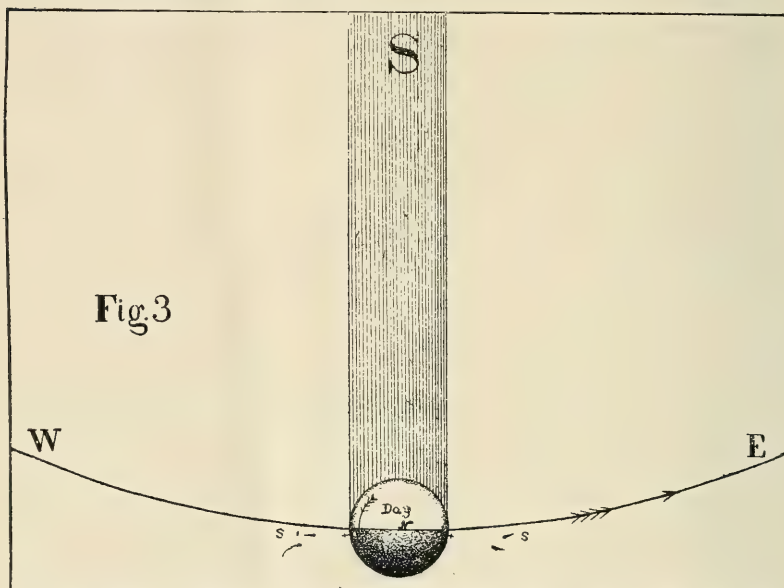
traversed in six seconds. One-sixth of it is the shooting star's velocity per second. Such observations and calculations show that usually a shooting star's height, when first visible is about 75 miles; and when it disappears, about 50 miles. Also, that its velocity ranges from 8 to 44 miles per second—indicating that its velocity through outer space, just before it entered our atmosphere, was about 26 miles per second. Its distance from the observer varies greatly, from 60 to 600 miles—possibly 770 miles.

The observed velocity is, of course, only relative to the earth. Its wide range, from 8 to 44 miles per second, is readily understood by considering Fig. 3.

In this figure, the earth is represented turning eastward about

its axis—N its north pole—and moving in its orbit eastward, the Sun being in the direction of S.

On observer at O has just passed into the evening shade. Relative to him, the earth's orbital motion, 18 miles per second, is **downward**. If he sees a nearly overhead shooting star it is overtaking the earth, and its velocity, relative to the earth, is $26 - 18 = 8$ miles per second. An observer at O' is soon to greet sun-rise. Relative to him, the earth is moving **upward** 18 miles per second. A shooting star above him is meeting the



earth, and its relative velocity is $26 + 18 = 44$ miles per second. To either observer, a shooting star crossing the earth's path will show more nearly the average velocity.

A notable shower of shooting stars occurred on the 24th, of November 1892. It continued for three hours after 8 o'clock in the evening.

That periodical star shower—the Bielids—will occur again this November—in the evening of some country. It may occur during our evening hours. If so, notice the slow motion of the “falling” stars. Should the reader be privileged to see the next Leonid star-shower, expected in the early morning hours of November 15, 1933, he will note the startling rapidity of the star-fall.

In general, the velocity of the evening shooting stars is less

than 26 miles per second, and that of morning shooting stars is greater.

Moreover, as the earth speeds on in its orbit its front is the sun-rise side and its rear is ever in the evening shade. We therefore see more shooting stars in the early morning than in the evening—just as in a walk or drive more people meet us than overtake us.

Mass or Weight

To find a shooting star's weight requires the help of an assistant observer at one of the stations. When preparing for the observations at W and L, Fig. 1, suppose an incandescent lamp of 16 candle-power was placed at an elevation above a high hill west of W, plainly visible to the assistant at W and distant from him just one half mile.

The assistant does one thing only. He compares the brightness of the lamp high up in the west with the brightness of each shooting star noted, and in each instance records his judgment as to the relative brightness of star and lamp. Of this he soon judges quickly and correctly, especially when the flitting star and the distant light are about equally bright. Even an unpractised eye decides readily which of two nearly equal lights is the brighter. Of hundreds asked by the writer which of the twin stars, Castor and Pollux, is the brighter, not one decided incorrectly.

Say that to the notes of Fig. 1 the assistant at W added: "brightness of shooting star and incandescent lamp just equal;" also, that the calculations of Fig. 2 proved that the shooting star's average distance from W was 60 miles. This data—distance of lamp, distance of star, their equal brightness—and established principles of Physics, will give the shooting star's mass or weight.

Since to make a one candle-power light requires 150 foot-pounds of work or energy per minute, the 16 candle-power light on the hill was produced by 16 times 150 ft.-lbs. of energy per minute, or by 1-10 of 16 times 150 ft.-lbs. of energy every 6 seconds; that is, it was made by using every 6 seconds 240 ft.-lbs. of energy.

The shooting star 60 miles off and shining 6 seconds, as observed, was just the brightness of the 16 candle-power light $1\frac{1}{2}$ mile away.

The intensities of two such lights—lights equally bright at different distances—are as the squares of the distances. In this instance then, their intensities were as 60^2 to $(\frac{1}{2})^2$, or as 14400 to 1. That is, the energy which produced the shooting

star's brightness was 14400 times 240 ft.-lbs. = 3456000 ft.-lbs. of energy.

For a body in motion, the established relation between its weight expressed in pounds, its energy in foot-pounds and its velocity in feet per second is $W = 64 \frac{1}{3} \frac{E}{V^2}$. So the weight

of our shooting star was $64 \frac{1}{3} \frac{3456000}{(26 \times 5280)^2} = \frac{1}{84} \text{ lb.} = \frac{1}{5} \text{ oz.}$

Not infrequently a meteor weighing many pounds reaches the earth's surface—as claimed for the black stone enshrined in the Kaaba at Mecca. But the usual shooting star which is dissipated in the air, is a light body—in many instances not more than a grain in weight.

Causes of Sudden Brightness and Quick Extinction

When a moving body is checked, or stopped, its seemingly lost energy instantly reappears as heat.

The simple clapping of hands—repeated checking of motion—heats them. A piece of iron on an anvil hammered sufficiently, becomes red hot. Visitors to the Chicago exposition in 1893 recall the muscular Samoan who, astride a dry log, so vigorously rubbed the end of a stout stick back and forth along a shallow groove in the log that soon it was ablaze!

Mechanical energy checked, is converted into heat at the rate of 772 ft.-lbs. of energy to one heat unit. The heat which raises the temperature of a pound of water one degree Fahrenheit is taken as a unit of heat.

The air's resistance checked and soon stopped our shooting star's swift motion, converting its astonishing amount of energy, 3456000 ft.-lbs., into a correspondingly large quantity of heat, 4477 units. This much heat would make a half-gallon of ice-cold water boil—and boil away as steam! Its self-evolved heat raised the substance of the shooting star to incandescence—caused its sudden brightness. Did it melt and vaporize the matter of the little meteor? Let us see. Had its weight been 84 times greater—a full pound—and its substance solid platinum, one of the most refractory of metals, it would have been melted by only 49 units of heat—provided the temperature was as high as 3230 degrees Fahrenheit.

Experiment shows that when a body speeds through air 125 feet per second its temperature rises 1 degree. If its velocity is doubled, its temperature rises 4 degrees; if trebled, 9 degrees.

That is, the number of degrees rise of temperature is the square of the times the velocity contains 125 feet.

Allowing that our shooting star was one of the slowest, its velocity only 8 miles per second, its temperature was raised

$\left(\frac{8 \times 5280}{125}\right)^2 = 11419$ degrees; more than three times the temperature at which even platinum melts.

It seems therefore, that whatever the shooting star's substance it is quickly raised to glowing heat; that if solid it is soon melted and vaporized—the melted matter being swept off by the rush through the air, forming the luminous train until none is left, when comes its sudden extinction. Its cooled vapors and ashes mingle with the air, and the dust-like débris slowly settles to the earth's surface.

Number Daily

Simple means will serve to effect a fairly accurate count of the number of shooting stars visible at a given place during a definite period.

At a selected station in an open space erect a pole 6 feet high.

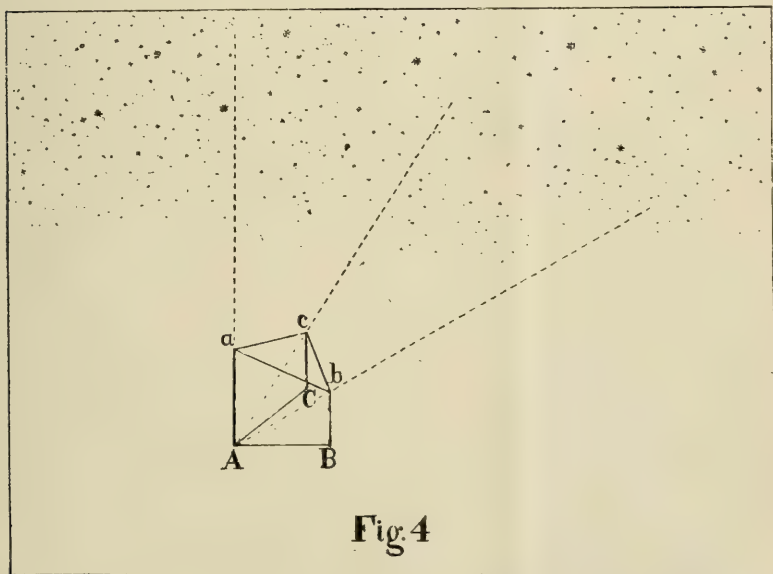


Fig. 4

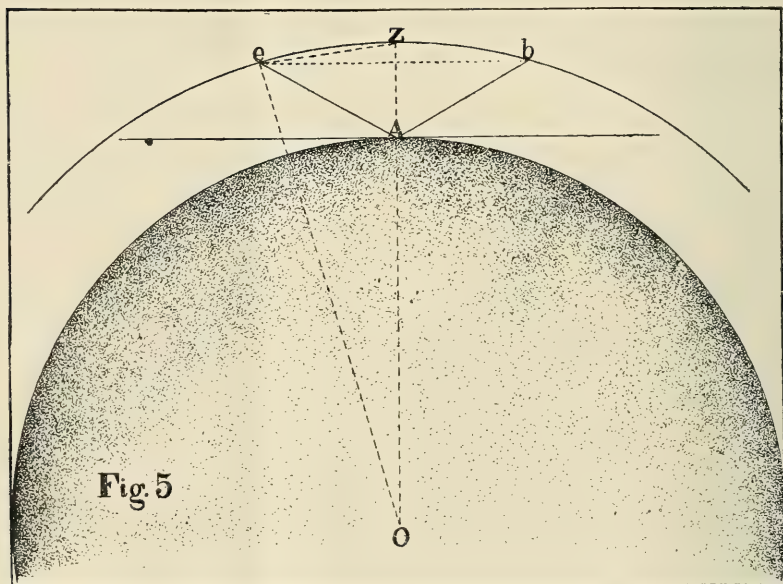
Trace from it on the ground two lines diverging 45 degrees—half a right angle. On each line, at a distance of 6 feet from

the pole, drive a stake. Connect these stakes by a stout string $3\frac{1}{2}$ feet above the ground, and from each stake, at that height, stretch a string to the top of the pole.

In Fig. 4, A is the station, Aa the pole. At distances and heights stated, the stakes Bb and Cc are connected by string be; and strings stretch from a to b and from a to c.

An observer, full length on the ground, his head at A and feet toward the stakes, scanning at his ease that part of the sky which appears within the triangle of strings, abc, will see just one-eighth of all the clear sky above the hazy zone around the horizon 30 degrees high. Eight observers so placed about A, each watching only the part of the sky marked off by his triangle of strings, would see all the shooting stars that appear in the clear sky while they watch.

On a fair evening it is found that each such observer sees a shooting star about every four minutes, or an average of 16 per hour. Eight observers see 128 shooting stars per hour.



Thus through the upper air surface—all of it that is above the 30 degree belt around the horizon—there must enter daily 24 times 128 shooting stars, or 3072 per day.

Fig. 5 will serve to show the full significance of this result—

that 3072 shooting stars enter daily the limited air space which our eight observers watch only a few hours.

In this figure the earth's radius $OA = 3959$ miles. The arc ebz indicates the level of air surface in which shooting stars first appear. Let us call it the surface of apparition. As previously shown, the height $Az = 75$ miles. Our eight observers, flat on the ground, have their heads about the pole at A . Their lowest line of sight Ab , or Ae , is elevated 30 degrees. Therefore angle $zAe = 60$ degrees. During their vigils they see all shooting stars that enter the zone of apparition capping the funnel shaped space eAb .

We must compute the area of that zone. The upper edge or rim of the funnel is a circle whose diameter is eb . The zone watched is that part of the air surface cut off by a horizontal plane through eb . It is called a zone of one base, and its area equals a circle whose radius is the distance ze . We must find that distance. In triangle eOA , angle at A being known, also the sides OA and Oe , we find eOA , or $eOz = 18^\circ 47' 47''$. In triangle eOz , knowing angle eOz and sides Oc and Oz , we find $ze = 126\frac{3}{4}$ miles. A circle of this radius contains 50462 square miles. The watched zone of apparition then covers 50462 square miles.

How many times larger than that zone is the entire surface of apparition which envelopes the earth at a height of 75 miles? Its radius $Oz = 3959 + 75 = 4034$ miles. Its area therefore, is over 204 million square miles. This is fully 4052 times 50462 square miles. That is, the area of the entire surface of apparition is 4052 times the area of the zone through which, as we have seen, enter daily 3072 shooting stars. Therefore, into the entire atmosphere enveloping the world there enter daily at last 4052 times 3072 shooting stars—in round numbers, 12½ million.

But had our eight observers held their vigils in the early morning before dawn, they would have counted more than double as many shooting stars per hour—indicating some 28 million per day.

Average the evening and the morning counts, and we find that the number of shooting stars which plunge into our atmosphere daily is fully 20 million.

Distribution

The earth with its air envelope to a height of 75 miles, or simply the whole surface of apparition, is a globe whose radius is 4034 miles. The space through which it speeds daily $18\frac{1}{2}$ miles per second, is more than $11\frac{1}{2}$ million miles long. Its cross

section, a circle whose radius = 4034 miles, has an area of more than 50 million square miles. This long cylindrical space through which we sweep daily contains more than $1\frac{1}{2}$ million $\times$ 50 million = 75 million million cubic miles. More accurately it is over 80 million million cubic miles. Since in this space we touch 20 million little masses, to each one there is a space of 4 million cubic miles. Each little mass, a shooting star when it enters our air, has around it 4 million cubic miles of free space. In general, it is at the center of a cube of space each edge of which is about 160 miles long. From center to center of such spaces is 160 miles.

We thus find that throughout the space traversed by our earth in its journey around the Sun embryo shooting stars, while always in motion, are distributed at intervals of about 160 miles.

Origin

Comets move in planes which all pass through the Sun, but cut each other at all angles. They therefore move through space in all conceivable directions. When nearing the Sun their volatile matter is driven off in streaming tails of great length, and much of it, disrupted and scattered, lost to the parent body, pursues at intervals approximately the same general path as formerly.

Not a few comets pass close by the earth's orbit, crossing it at different points and at different angles. Some of these, as in the well known case of Biela's comet, have been shattered by disintegrating forces. They have ceased to appear as comets. In their stead, when due, are showers of shooting stars—the débris of the disrupted comets. That part of the passing débris swarm which enters our atmosphere is checked by the air's resistance, as was shown, and falls to the earth. The rest passes by until, on another round, it again grazes us, and is again diminished by another star-shower.

This doubtless is the origin of shooting stars which come in showers—like the Bielids every thirteen years, and the Leonids at intervals of thirty three and a third years—also of stragglers which, like the August Perseids, come annually.

Possibly, in the débris of shattered and shattering comets we have the origin of all shooting stars.

Effects

We have seen that a shooting star weighing 1-84 of a pound

is dissipated by its self-evolved heat, that its vapors mingle with the air and its ashes settle to the earth.

Our world is thereby made 1-84 of a pound heavier!

Take this as an average, and the 20 million shooting stars per day make the earth 125 tons heavier. This daily addition amounts to 45000 tons yearly.

How much will this increase the earth's size? Allow that all this meteoric matter, 45000 tons annually, finally settles to the earth's surface in a continuous layer of uniform depth; and that, like some common earth, a cubic foot of it weighs 80 pounds. Having the earth's radius, 3959 miles, we find its surface area is more than 5000 million million square feet. If covered with meteoric matter one inch deep, the weight on each square foot would be 1-12 of 80 pounds = 6 2-3 pounds. On the entire surface there would rest a weight of 33 1-3 thousand million pounds, or 16 2-3 million million tons. This is 370 million times 45000 tons, the yearly deposit.

That is, in 370 million years this accumulating shooting star dust will form on the earth's surface a layer one inch deep!

That 45000 tons of matter added to our earth every year for 370 million years would raise the level of its surface only one inch, may well expand our conception of the vastness of our earth.

We have seen, too, that one shooting star evolved 4477 units of heat. At that rate, 20 million daily bring us over 89½ thousand million heat units, and in a year, over 32 million million units of heat.

Uniformly distributed, how much heat is this to each of the 5000 million million square feet of the earth's surface?

Evidently, to each square foot only $\frac{32}{5000} = \frac{6\frac{2}{5}}{1000}$ of a heat unit.

Contrast this with the heat we receive from the Sun.

Skillful experiments prove that the Sun sends to each square foot of the earth's surface on which it shines an average of 11

heat units per minute, or $\frac{11}{60} = \frac{110}{600}$ of a unit per second, or

$\frac{110}{6000} = \frac{18\frac{1}{3}}{1000}$ of a heat unit in 1-10 of a second. That is, we

receive from the Sun in 1-10 of a second nearly three times as much heat as is brought to us by myriads of intensely heated shooting stars in an entire year! The contrast serves to quicken our realization of the Sun's dominance in the support of terrestrial life by its constant, incomparable yield of heat.

BULLETIN

OF THE

Southern California Academy of Sciences



LOS ANGELES, CALIFORNIA, U. S. A.

JANUARY, 1908

BULLETIN

OF THE

Southern California Academy of Sciences

Committee on Publication:

Melville Dozier

A. Davidson, C. M., M. D.

Wm. H. Knight

CONTENTS

Editorial Notes

Environment on Butterfly Forms

Is Mars an Inhabited World

Diatoms

Lord Kelvin—*An Appreciation*

Juglans Californica Wats

Ancestors of Our Whales

Calcium Flocculi of the Sun

Report of Secretary Dozier

Astronomical Section

Geological Section

Biological Section

All-Inclusiveness of Science

List of Members

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Editorial Notes

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Los Angeles is becoming a recognized center of science, literature, art, music, and learning in every realm of human thought, not alone for the great Southwest of which it is the metropolis, but, in consequence of the annual tide of tourist travel which sets in this direction from all parts of the country and from many other lands, it is becoming one of the world's great centers of culture and education.

Among the institutions which have given this city an enviable reputation is the Southern California Academy of Sciences, which has for its special object the investigation of natural phenomena and the dissemination of scientific truths.

With the present number of the Bulletin the Academy of Sciences inaugurates an important change in the publication, making it semi-annual, adding to the variety and scope of its contributions, and embracing more fully than in the past, articles relating to the several departments of science. There has been an encouraging increase in membership lately, and it is hoped by the Publication Committee that enough additional members may be secured to warrant the issuance of a quarterly Bulletin, thus enabling us to keep fully abreast of the scientific thought and progress of the age.

The work of the Academy is being conducted with great vigor. Interesting and instructive lectures, popularizing some branch of scientific inquiry, are given to intelligent and appreciative audiences at Symphony Hall, on the first Monday of each month. All of the other Monday evenings of the month are occupied by Academic Sections where subjects requiring more technical treatment are discussed by specialists.

FEB 26 1908

The Astronomical Section has an equatorial telescope with a four and one-half-inch objective, capable of showing the discs of the planets, separating many beautiful double stars, and resolving numerous star-clusters. Current astronomical events are reported and elucidated at these meetings.

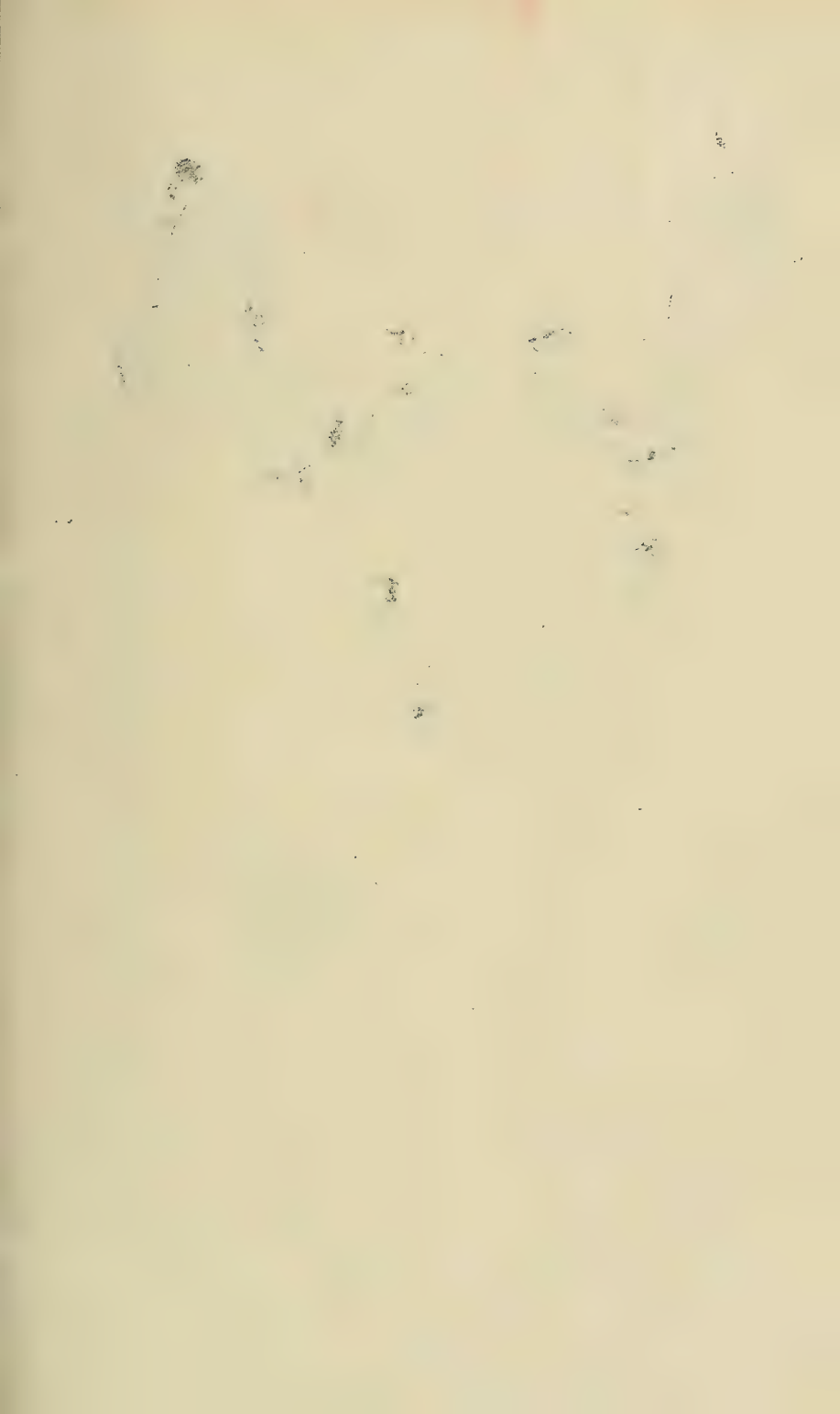
Geologists and mining engineers familiar with the geological formations of the great Southwest and its rich and varied mineral products, have made the evenings devoted to the Geological Section particularly attractive. Charts of the structure and workings of famous mines, theories of vein formations, the part that chemical action is playing in aggregating and disseminating the precious metals, and theories of the origin and occurrence of our immense fields of crude oil in Southern California, have proved profitable subjects for discussion at these meetings.

The Biological Section has done some of the most useful work of the Academy. Its wide range of subjects, the ability with which they have been discussed, the excellence of the illustrations used, the beautiful slides which have been prepared, and the free use of microscopes of great magnifying power, have added greatly to the charm of these meetings.

W. H. K.

Astronomer in an Iron Tank.

While Prof. David Todd, the astronomer, was on the top of the Andes last summer, nearly three miles above sea level, observing Mars and taking his marvellous photographs of its canals, he worked for a time in an iron tank about six feet square, into which the air was pumped until the pressure within was the same as that at the level at the sea. The compartment was lighted by electricity and was connected with the outer world by telephone. This device enabled the professor to do work which would otherwise have been impossible at that great elevation.





Colias Eurytheme—Boisduval
Southern California

Males—Lower Three Specimens

Females—Upper Two Specimens

Environment—Its Effect on Butterfly Forms

By J. R. Haskin.

The study of Butterflies at first glance seems to the unthinking majority to be a very trivial pursuit. As a science, however, it presents many points of interest which increase rapidly as one goes more and more deeply into the subject. To the beginner, the raw amateur, it sometimes seems as if distinctions were too finely drawn, and certain forms were differentiated into far too many species. But as one progresses in the study, one soon realizes that he is face to face with Darwin's theory of the evolution of species and that the changes, great and small, which he gradually becomes able to distinguish, are due to environment.

The genus **Colias** illustrates very nicely these changes which the influence of climate and food produce in the size and coloration of butterflies. A well-known authority specifies eleven species that are fairly well defined, but he, also, states that there are a number of other named species as well as numerous varieties from the Central and Western States. These numerous species differ very slightly from each other in many cases, but if a sufficient number of specimens from each locality be grouped and compared with each other, the difference can readily be seen.

Generally speaking a warm equable temperature and abundant food produces the richest coloring and largest specimens. **Colias Eurytheme** illustrates this particularly well on account of its being a triple-brooded southern and western species. Those specimens taken late in the Fall and early in the Spring, (Form **Ariadne**) show the effects of a meagre diet and exposure to the nipping cold night temperatures by their small size and the absence of the rich coloring of the Summer form, shown in the accompanying illustration. It seems, in fact, hardly believable that these widely different forms are of identically the same species. **Ariadne** is small and insignificant looking, pale yellow in coloring, with only an occasional touch of orange. The typical Summer form, on the contrary,

is in general, highly decorated with orange which often shows a rose madder tint when held in certain lights.

The reader will note that we say in general when referring to Eurytheme's coloring. This is necessary for the reason that the female of **Eurytheme** is strongly polymorphic, that is to say, it has various forms. While the markings of the female are rich and full in all cases, the ground color varies from the tints described above to plain yellow and even whitish. This is another curious phase of the subject which is still under investigation, and which further complicates the study. It may readily be seen that when one species is subject to such changes it is necessary to know whence it came in order fully to identify and classify it. An amusing example of this occurred recently when a collector now connected with one of the large Eastern museums sent a specimen from a Southern postoffice to one of our best known authorities with a request that it be identified. It was returned labeled, *C. Eurytheme*, and was immediately forwarded again, from an Eastern address. This time it was returned labelled, *C. Philodice*.

Now, the standard types of the two species are decidedly different, but certain specimens of the yellow and whitish Southern females closely approach the female of *Philodice* in appearance, so that by falsely locating the place of capture, even the most experienced collector can be misled. As a general rule, however, the specimens from one locality follow a certain type of marking and coloring that was very certainly produced by the physical qualities of the surroundings. It is this fact which makes the study of our butterflies so interesting and which allows of so much careful study and research without exhausting the subject.

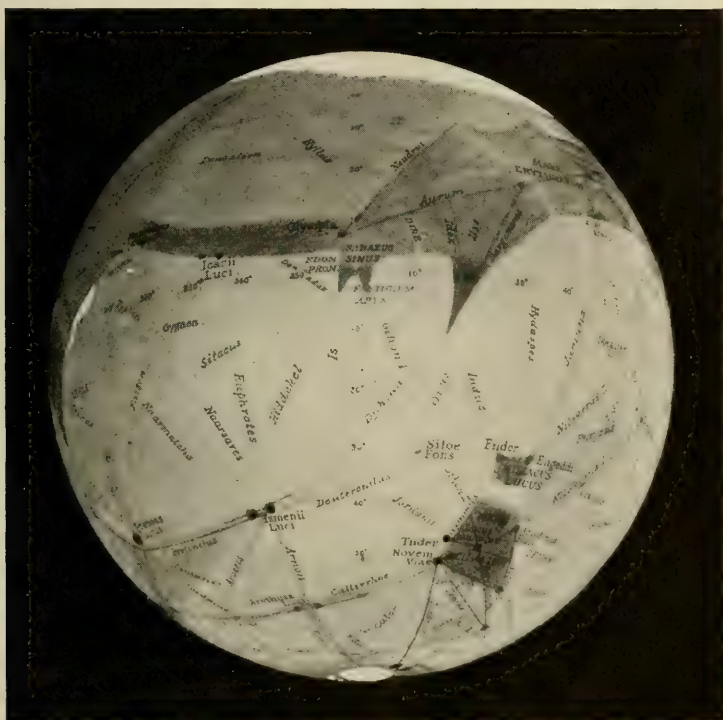
Captain Collins in Europe.

The secretary of the Astronomical section, Capt. Holdridge O. Collins, went abroad in October, accompanied by his daughter, Miss Constance, and while in Vienna visited the Imperial Observatory, where he met the distinguished director, Dr. Edmund Weiss, with whom he had a pleasant interview. A description of the buildings, instruments, library and working force of astronomers will be furnished to the Bulletin later.

Is Mars an Inhabited World?

By Wm. H. Knight.

At the last "favorable" opposition of Mars, which occurred in the months of June and July 1907, that planet approached within 38,000,000 miles of the earth, and shone the most resplendent object in the nocturnal heavens. It was at



Reproduction by permission of a fine drawing from a photograph of the planet Mars, taken at the Lowell Observatory, Flagstaff, Ariz., during the "favorable opposition" of 1907, under the direction of Dr. Percival Lowell.

a similar opposition in August, 1877, that Asaph Hall discovered the two minute satellites of Mars, and Schiaparelli first discerned the so-called canals on its surface. But even the existence of these lines was doubted by less sharp-sighted astronomers till, in the favorable opposition of 1892, more powerful instruments confirmed Schiaparelli's observations. The

geometrical regularity of the lines pointed to an intelligent origin, and the probability that Mars is inhabited was a frequent theme of discussion, both by astronomers and laymen.

The astronomer who has been foremost in supporting this view during the present decade is Percival Lowell, whose exceptional facilities for observation at Flagstaff, give his opinion great weight. The high altitude of his observatory—7,000 feet; its low southern latitude, bringing the planet many degrees nearer the zenith than Yerkes, Harvard, Greenwich and other large observatories; the powerful refractor (24-inch objective) with which he is equipped; the freedom from atmospheric disturbances on his elevated plateau, giving him unusually "good seeing;" and above all, the keen eyesight of Professor Lowell—almost a special gift; all these combined advantages have enabled him to study the planet under ideal conditions, and thus to reach just conclusions.

He believes that the geometrical figures he has observed on the surface of the planet were designed by engineers of no mean order of intelligence. They are not myths, but actually exist and are clearly defined and readily mapped at certain Martian seasons, become dim and in some places fading out at a later stage, only to distinctly reappear at the return of the former season. They are not geological cracks in the crust of Mars, for the chances are more than a million to one against chance cracks arranging themselves into a system so orderly and symmetrical.

In order to secure a still better station for the observation of Mars while in astronomical proximity to the earth, Prof. David Todd established himself at a high altitude in the Andes, where the planet was nearly overhead, and succeeded in taking some 7000 photographs, many of which are so clear and excellent that they not only show the canals with remarkable distinctness, but even the doubling of many of the canal-like lines. The latter is a phenomenon hitherto observed only with the eye, and these photographs forever set at rest all cavil regarding the existence of these enigmatical lines. Thus does the beautiful art of photography supplement and confirm the patient, keen-eyed observations of the skillful astronomer.

Nature of the Canals.

Conceding, then, the existence and the artificial origin of these canals, the question arises, what is their nature; how are they produced; what purpose do they subserve? But first, let us consider one of the most serious objections which have been raised by astronomical writers against the habitability of Mars, namely, its assumed low temperature. The earth is

only two-thirds of the distance of Mars from the sun, which fact would imply, under similar surface conditions, a temperature so low that the higher forms of life here could not survive on that planet.

But Mr. Lowell points out modifying conditions on both planets. The earth, he avers, reflects off into space, a large percentage of the heat it receives from the sun, while the surface of Mars is such that it absorbs a much greater proportion of the sun's heat than does the earth. Now the average temperature of the earth's surface is 60 degrees F. This heat is derived from the sun and does not seem to be any more than we need for the best development of life as we know it. Yet life is abundant in regions where the temperature is higher, and also where it is much lower than this average.

For the reason named, and for the additional reason that no dense clouds intercept the sun's rays, Mr. Lowell estimates the mean temperature of Mars at 48 degrees—only 12 degrees less than the earth's, and concludes that this temperature would not be incompatible with the development and support of a high order of life.

Agility of the Martian.

Now let us take account of certain advantages possessed by the Martian inhabitant. Mars has a diameter of only 4200 miles as compared with the earth's 8000 and the mass of the former is only one-ninth that of the latter, hence an object weighing 100 pounds on the earth would weigh only 38 pounds on the surface of Mars. If their people correspond with ours in size, they can move with great agility and skim over the ground with the ease of wild animals. Then what great tasks of physical labor they can perform, what great masses of soil, (also of low specific gravity,) they can displace without fatigue. Tasks that would be deemed Herculean here, might be readily performed under those favoring Martian conditions.

But Mars has, from our point of view, a serious drawback—its atmosphere being much rarer than that which we breathe. Owing to the great mass of the earth and an enveloping atmosphere more than 100 miles deep, the latter presses with a weight of 15 pounds upon every square inch of surface. The Martians, however, would regard this as a great handicap, but as life here has been adjusted to this density and pressure, we may presume that the types of Martian life have conformed to the peculiar conditions existing there.

Another apparent drawback on the planet Mars is an absence of moisture-laden clouds, and the consequent lack of rain, especially in the central zones. Results: the general surface of

Mars presents the aspect of a parched desert, where life, without an artificial supply of water, could not exist. But, as in our own cloudless skies, the air contains large stores of invisible vapor, so it is evident that the same conditions prevail in the clear Martian skies, for when the Martian polar regions are turned away from the sun in the Martian winter, there is an extensive precipitation of snow, known to us as the polar snow cap, and as the season slowly changes to spring and summer, (the Martian year is nearly twice the length of the earth year,) the polar snow cap is gradually melted, and a dark belt, presumably consisting of water, is formed around the white, receding snow cap.

Whether this in an artificial basin for the retention of the water till it can be utilized, we have no means of knowing, but this we do know, that in their season, dark straight lines extend at various angles from this polar belt towards the equator, intersecting other lines similarly projected from the opposite pole, their meeting places forming apparent oases or basins.

Belts of Verdure.

Now these lines, in order to be visible in our most powerful telescopes, must be at least five miles in width, but are assumed to be from three to five times that breadth. Of course it is not to be supposed that there are any artificial water courses of that width. Such a hypothesis is neither reasonable nor called for. But suppose that each main canal, possibly of but a few feet in width, with its system of small lateral branches, were employed to irrigate a belt of territory 20 to 30 miles in width, then in its season there would spring up a mass of dark green vegetation which would form a marked contrast to the yellow, unirrigated desert adjacent to it, and that contrast would become strikingly apparent to terrestrial observers with powerful glasses.

Thus we see, at a distance of 40,000,000 miles, certain dark lines, which mysteriously appear, coincident with the receding snow caps, and as the season advances to the harvest period of their year, the lines become dim and some of them fade out entirely. For these belts of dark, luxuriant vegetation, having ripened, have probably changed to the tawney color of our California fields and hills in summer and autumn. So the Martian astronomer, looking down upon the State of California, will in the winter and spring months, see a belt of vivid green, 150 miles in width and 800 miles in length, but this will change to a saffron hue during the last half of the year, greatly to the mystification of the Martians.

What are the Martians raising in these long bands of ver-

ture, with which nearly the entire surface of the planet is reticulated? Is it fruit, cereals, vegetables, or some melon-like food of rapid and luxurious growth? What machinery does the Martian use in cultivating the soil, in gathering his harvest, in hauling it to the storehouse and to the market? Is he gregarious, does he dwell in cities, has he developed electric light and power, do his bankers refuse specie payments and resort to clearinghouse certificates?

We must wait for Mr. Hooker's gigantic 100-inch eye, which will be peering into Martian and other mysteries when the next favorable opposition occurs in 1924, before we can satisfy our scientific craving for more particulars, and perhaps even that mighty optical aid will be unequal to the emergency, for Mars lies across an appalling abyss of space, too fathomless for human genius to bridge in the present stage of scientific achievement. We can only get imperfect glimpse, now and then, but these supply data sufficient for reason and imagination to construct a hypothesis, perhaps a substantial theory, of life on a brother planet, traveling, like the earth, in a mighty orbit round the sun.

Astronomical Paradox.

Here is a little feathery comet, so attenuated that it does not dim the lustre of the smallest stars when interposed between them and the eye; so inconsiderable in mass that it has eluded the attempt of any mathematician to weigh it; so that today no astronomer can tell whether the mass of Encke's Comet is to be computed by tens, hundreds, thousands or millions of tons, yet this seemingly almost imponderable member of our solar system, swinging in an ellipse reaching from Mercury to Jupiter, has been successfully employed in weighing the masses of those and the intervening planets.

Diatoms

By Miss Sarah P. Monks.

Diatoms are organisms that have characteristics of both plants and animals. Unlike other plants they have the power of voluntary motion, and, unlike most animals, they possess chlorophyll. They are microscopic.

Zoologists look at them askance and botanists do not want them, but they are the pets of the microscopist, and well they

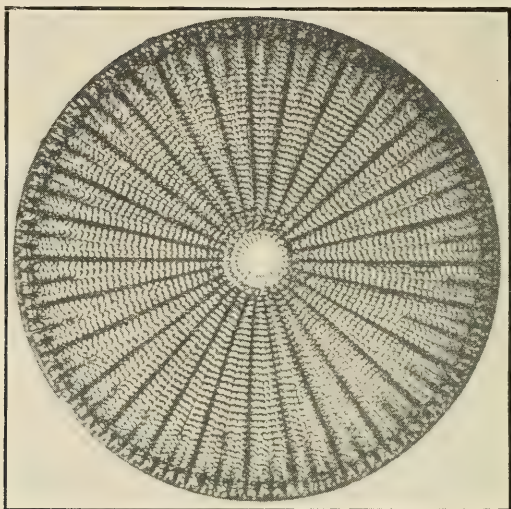


Fig. 1. Arachnoidiscus Mag. 300 Diam.

Micro Photograph by S. J. Keese

deserve this honor, for they are among the most exquisitely beautiful objects of the world.

They, unlike plants, have a silica shell composed of two valves, one fitting over the other like the lid of a pill box. These glassy valves are decorated with knobs, points and striæ, arranged in the most varied and delicate tracery. Sometimes under a low micro power, diatoms appear changeable, blue, green and various colors, because their tiny projections break the white light into its rainbow tints.

Diatoms are at present, classed as brown algæ, or sea weeds, on account of the dark brown pigment under their siliceous shell.

An interesting fact in regard to color was noticed by the Russian diatomologist, C. Mereschowsky, among the recent

diatoms of San Pedro. It was a species of diatom without color. It moved, acted and lived like a diatom, was a navicula.

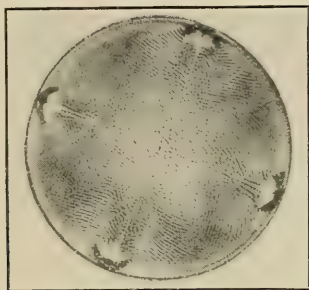


Fig. 2. Aulocodiscus, Mag. 200 Diam.
Micro Photograph by S. J. Keese

but had no brown pigment, no chloraptyll and sailed as a phantom among its fellows.

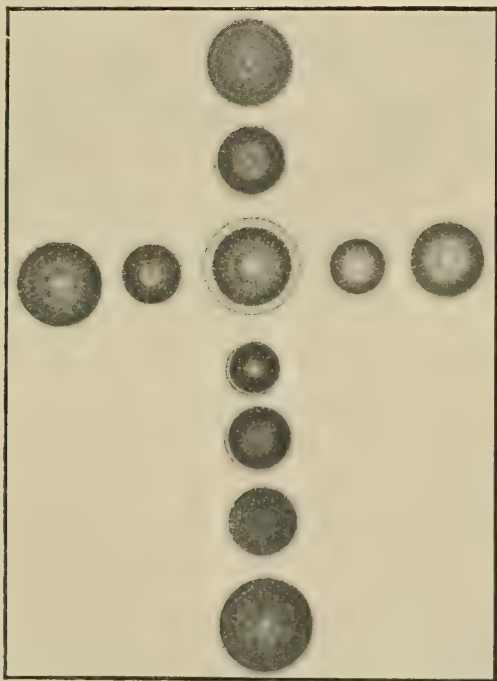


Fig. 3. Mag. 200 Diam.
Micro Photograph by S. J. Keese

M. Mereschowsky explained it thus: Living among the waste of the fish cannery, surrounded by an abundance of nutrient material—a sort of predigested breakfast food—this spectre of a diatom, not using its chlorophyll to manufacture its dinner, had lost the chlorophyll just as do the parasites among its kinsmen of the higher plants.

Diatoms vary indefinitely in shape. Some are round, others oval, squarish, triangular, elliptical, rod-like, or boat-shaped.



Fig. 4

Micro Photograph by S. J. Keese

One kind, *Isthmia*, very abundant on Pacific algæ, looks like a fat little money wallet, with a decorated strap buckled around to keep in its valuable contents. Salt water has more of the round, or roundish, kind and the long forms are more common in the fresh water. Figure 1, *Arachnoidiscus*, and Figure 2, *Aulocodiscus*, are round fossil forms from Redondo Beach, and they show something of the pattern and arrangement of projections. Figure 3 is an artificial arrangement of eleven. This kind breaks up the white light and under a low power objective, with the slightest motion, change color and glow like the slumbering hues and fire of jewels.

Figure 4 gives an idea of the variety of size and form of diatoms.

Diatoms are found singly or in colonies; free or attached; in hot or cold, fresh or salt water, recent or fossil, all over the world. Their motion is deliberate, in marked contrast with the irritable impatience of the Infusoria, which are their pond companions. One boat-shaped diatom called *Navicula* (of which there are two or three hundred species), is so abundant in all fresh water pools and ponds that nearly every microscopic mount shows a quantity of specimens and often several species.

These fairy brown fleets go moving across the field, sailless and rudderless, with a steady and gracefully easy motion. If perchance one meets with an obstruction, a bit of algæ, fibre of wood, or grain of earth, it bumps against it obstinately several times, then, convinced that its Northwest passage is blocked, it backs off and sails backward with equally deliberate dignity.

One odd species is called *Bacillaria paradoxa*. Its motion is most peculiar. This *Bacillaria* is composed of numerous rod-like pieces that can move upon each other, and it has the power of attaching itself to objects. Slowly across the field may be seen extending a jointed rod, its parts sliding past each other like a sliding ruler, till it attains its full length. Then the pieces slide backward, and, an arch, or zig-zag figure, or pontoon bridge is formed, the arrangement varying constantly with the ceaseless motion, till one is weary of watching. This peculiar species was abundant on Flower street, back of the State Normal School, before its ocean was drained and dried up for the good of the public.

The siliceous shells of diatoms are practically indestructible, and consequently they are an important item in world building. They are found in all geological strata as far back as the Devonian, and probably, much of the amorphous silica of the Silurian Age was at one time diatom shells. The fossil deposits are called diatomaceous earth.

Abundance of Diatoms.

These plants must have existed formerly in inconceivable numbers, for their remains form extensive beds of miles in extent in almost every country of the world.

The earth is abundant in California, and all states of recent geologic formation. "The city of Richmond, Va., is built on such a deposite, from two to eighty feet thick and several miles in extent." The city of Los Angeles has its share. There is a large area of this earth under the court house, another

at Second street and Bunker Hill avenue, another on Flower street, between Second and Fourth streets. In fact, there is scarcely an outcrop, or a street cutting, in this city, that does not show some diatomaceous earth. The forms, however, of Los Angeles diatoms are not rare or remarkable. A large *Coscinodiscus* is extremely common.

The most extensive deposits in this locality is at Redondo Beach, about two miles from the city. Here, the entire bluff, about eighty feet high, and at least a quarter of a mile on the sea front, is composed of diatomaceous earth. As a similar deposit crops out five miles back from the sea in all probability they are continuous. Here the earth is of all conditionss and colors, soft, friable, in loose, thin layers; white, compact yellows, brown almost black. Like all the Coast bluffs, this place shows a surface of pinnacles, abrupt fronts, huge masses that have loosened and slid part way down and debris of all sizes at the base, but all here is of unmixed diatomaceous earth. Throughout this deposit there are flinty masses looking like petrified wood, which are supposed to be metamorphic diatom remains. It is called Diatomite. Specimens from Redondo have been distributed all over the world, and the locality is famous for richness in forms and number of specimens. Unlike chalk or clay, which it somewhat resembles, this earth is of extremely light weight.

The compact varieties float. At Redondo sometimes rounded pieces from the size of a marble to lumps a foot across, are strewn on the beach for a mile or more, where they have been washed ashore after floating and being rolled about by the waves. It is possible that the famous "floating find" of a number of years ago that was caught by fishermen off Santa Monica, was a bit of flotsam from the Redondo quarry. This piece was unique in number of species, and is one of the most famous lumps of the world. Its resting place before it began its voyage is unknown and regrettable, and is as fondly sought as a "lost mine."

Their Beauty Under the Microscope.

Diatoms have been used for a long time as "tests" of the power of objectives, because of the variety and symmetry of their designs and the great range of size.

One cannot consider diatoms without admiring the skill of microscopists, who mount them; and it is a question of which excites the most admiration, the marvelous beauty of these plants, or the rare dexterity of the scientists. Indeed, the compositions of E. Thum, of Leipsic, are so surprisingly wonderful that they are called the "Oh my!" slides. The diatoms

are made into what is called "Type plates" where from 100 to 150 forms are arranged in symmetrical rows in a square, or they are made into concentric order or fancy designs of vases, fountains, of bouquets of flowers, all well within the scope of a one one-half inch objective. In fact, the whole figure is so small that, to the naked eye, it appears as a mere blur on the cover glass. And the deft way it is done adds to one's admiration. The earth is cleaned from fragments and sponge specules, and the different species sorted out under a microscope, all requiring great care and delicacy of touch. Then the diatoms are picked up, one by one, and put in their places in Canada balsam on the slide, then covered and laid away to dry. The lifting and placing is done by an instrument called the mechanical finger, which is made to move up and down from side to side by means of screws. But the funny thing about it is that the tip of this finger is made of a cat's whisker. Nothing has been found to be such a good diatom lifter as pussy's whisker.

When one is bitten by the diatom craze, the only hope is a microscope, and long delightful tramps with dip net and bottles, or hammer and basket for possible forms.

Each pool and brook is a treasure land, or water, and the sun-baked street or railroad cuttings become wondrous mines; and His Majesty who delights in idle hands, will have an uncomfortable quarter of an hour when the evening or holiday brings time for a micro hunt among the treasures collected from the pools or the great white earth deposits.

Celestial Measures.

In the beginning the number of days in a year was assumed to be 360, and it was observed that the sun traverses one-360th of the celestial circle each day. The 360 divisions of the circle were named steps, or degrees. As astronomical observations grew more exact each of these degrees was split into 60 parts, *partes minutae*, whence our minutes. These were again divided in 60 more, called *partes minutae secundae*, whence our seconds.

Photograph of the Sun

The view presented herewith is an excellent reproduction of a photographic image taken with the spectroheliograph of the Snow telescope at the Solar Observatory on Mount Wilson by



Photograph of the bright calcium flocculi of the sun, reduced from a photograph 13.3 inches in diameter, taken with the spectroheliograph of the Snow telescope at the Solar Observatory on Mount Wilson, under the direction of Dr. George E. Hale.

Dr. George E. Hale, on July 26, 1906, at 5:26 p.m. It was taken with the light of the calcium line H₂, and shows the bright clouds of calcium vapor, or calcium flocculi. It is a notably fine specimen of an exceedingly ingenious device invented by Dr. Hale for securing photographic images of any

particular chemical element desired which may exhibit itself as glowing gas or vapor in the sun's photosphere. The white patches are outbursts of dazzlingly bright calcium vapor surrounding a group of large sun spots, and being expelled with great velocity from the sun's interior to a height of many thousands of miles, they indicate the play of titanic forces beneath the sun's photosphere.

A still more extraordinary outburst was observed by Dr. Hale some years ago. The brilliantly white calcium flocculi rapidly formed around and closed over a large swirling, cyclonic spot, completely shutting it from view in less than 27 minutes, and spreading till it covered a vast area estimated at 400,000,000 square miles. "An hour later the eruption had settled down, the vapors had passed away, and the group of spots looked as it did before the eruption took place." The next day a great electrical storm occurred on the earth followed by one of the most brilliant auroras that was ever witnessed in this country.

These are examples of the gigantic scale on which the mighty forces generated in the intensely heated gases of the sun are operating.

Ancestors of our Whales

Miocene.

By Prof. J. Z. Gilbert.

Branch; Mammalia. Order; Cetacea. Sub-order; Mysticeti. Family; Balaenidae. Genus and Species not determined, probably new. Locality. In the hills of Los Angeles city would seem a strange place to find whales, and yet when the conditions are studied there is no reason why whale fossils should not be unearthed there.

In fact the occasion of this preliminary sketch is a find of fragments of an ancient whale made in the miocene rocks of *Clever Cañon; at the east end of East Avenue 33, Los Angeles, California.

Whales Unique.

Whales seem from the record in the fossils of the rocks to have appeared suddenly upon the scene of action and in such well differentiated types that a more generalized ancestral form must have given rise to them, but such a type has not yet been found.

Whether they came from some gigantic land form and degenerated in taking to the water, or whether they had their origin in some water form and never developed the pelvic girdle and legs of the present mammals is yet a mystery.

The whales are unique, too, in not being a fading race shortly to become extinct, but this branch of the animal tree is green and vigorous yet producing larger and more varied forms than have yet appeared. This race might continue for millenniums were it not that it is likely to be cut short by the intrusions of man decreasing rapidly the numbers and limiting the natural supply of food.

Two distinct types of fossil whales occur: the toothed whales (Odontoceti) and the toothless or baleen whales (Mysticeti.)

Plates I and II; Fig. 1-3.

The specimens figured and briefly described below were not in situ when found, otherwise much more of the skeleton might have been obtained. If further finds and investigation bears out the present indications this find is interesting since it

*Named by Harriette Y. Gilbert.

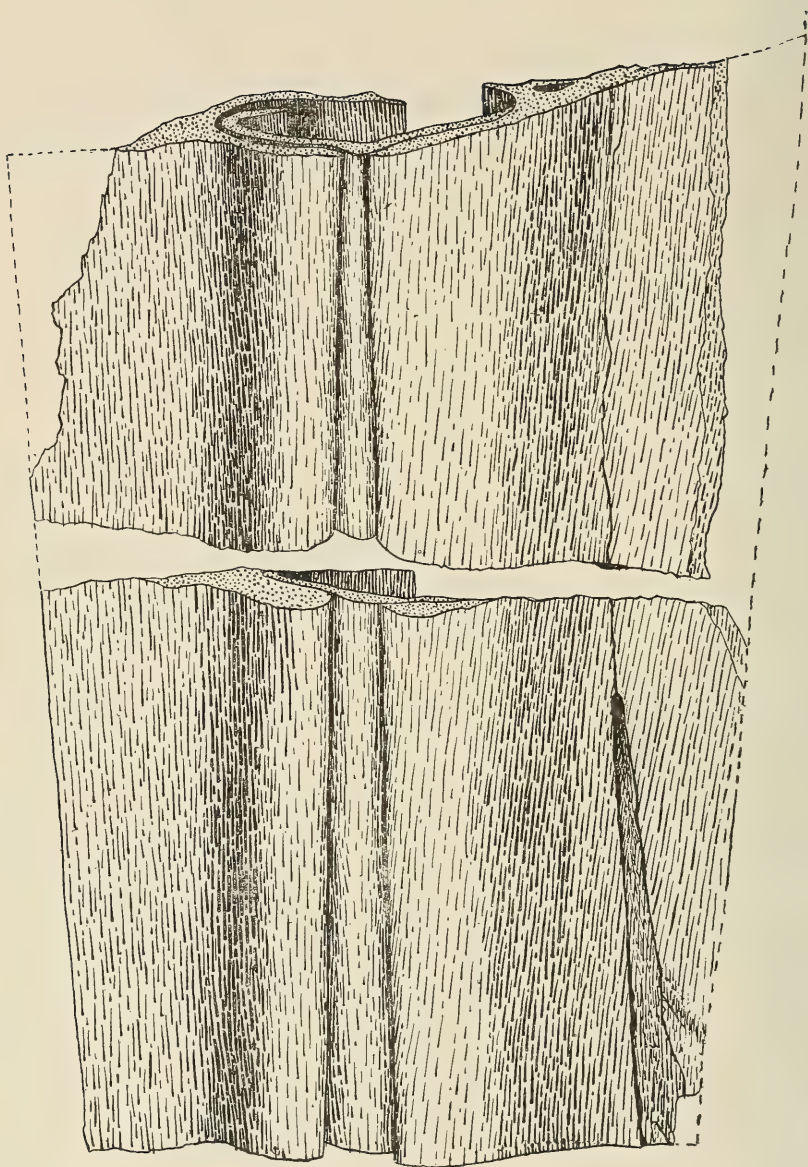


Plate I

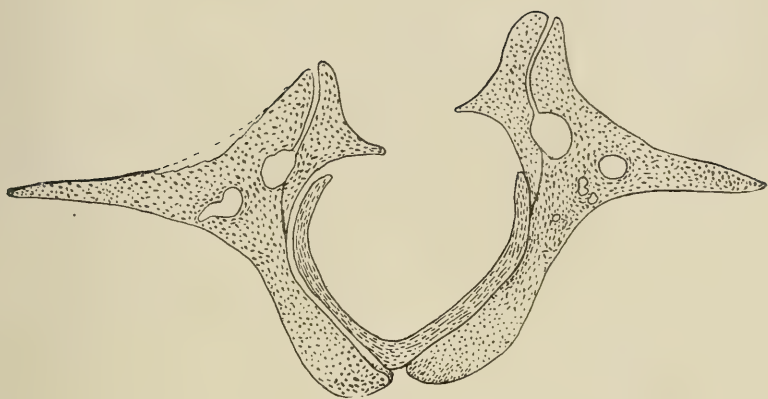


Plate II.

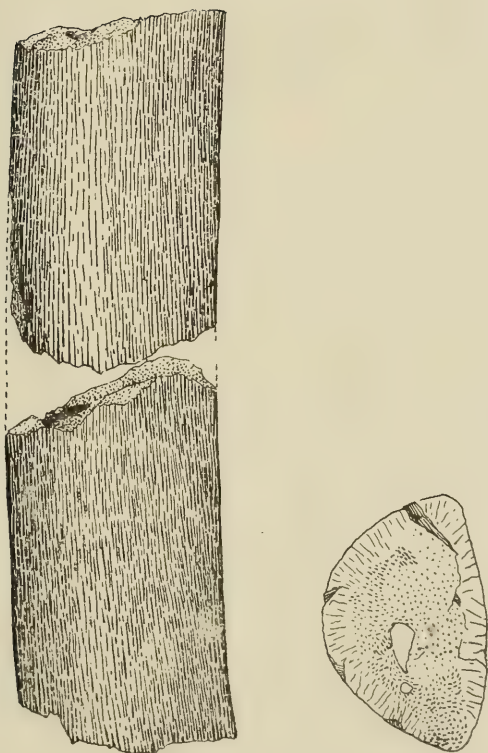


Plate III

promises to throw light upon the problem of the ancestry of our modern baleen whales.

The Find.

The find consists of two fragments of a skull evidently from the posterior middle portion of the nose part, and of parts of the low lower jaws. The fragments consist of the maxillaries, pre-maxillaries and nasal bones. The specimen in being laid down was slightly distorted, but the bones are in a perfect state of petrification.

Judging from the size of the fragments this animal when living was approximately 25 feet long, and by the contour of the lines definitely shown the skull was more elongated than that of the living whale. The maxillaries curve strongly outward posteriorly; and the nasal bone thins rapidly forward suggesting that it was very much shorter than the maxillaries and premaxillaries or that this is a specimen of a young animal, hence ossification being not complete.

The baleen surfaces are smooth and evenly curved, and a large blood-vessel path is found here. All of these points are duplicated in our living baleen whales.

The fragment of the lower jaw shows no signs of gingival dental canal or foramina, but the ramus shows a large dental canal near the center. Pl. II, Fig. 2-3. A foramen for a blood vessel appears, but no Meckelian fissure is present. The ramus is slightly curved inward and upward simulating the modern whale's jaw.

Thus the absence of teeth, and no traces of a dental groove, the slight curvature of the ramus, a centrally located dental canal, the elongated nasal portion, and the well-defined baleen surface identify this find as being an ancestral type of our modern baleen whales. I have little doubt that this specimen will prove upon further investigation to be very nearly akin to the whales that now inhabit the waters of our coast, and give to us a new species if not a new genus.

It is interesting then to note that at no distant day, geologically speaking, the hills we have at present were in the sea, the flinty sand-stones were being laid down while the predecessors of our whales sported over them and in turn died and were buried. Disintegration began and particle by particle the living substances gave place to infiltrating silicious material and the petrified form was made. It now awaited the orographic movements of our coast to land it high and dry and subsequent erosion to reveal its presence and enable us to have an idea of its interesting past.

Measurements.

Total length	37.00 cm
Width between the outer edge of maxillaries, posteriorly	31.50 cm
Width between the outer edge of maxillaries, anteriorly	27.60 cm
Vertical diameter of nasal canal posteriorly	9.00 cm
Vertical diameter of nasal canal anteriorly	4.80 cm
Width between the inner ventral margins of maxillaries	1.40 cm
Width between the inner ventral margins posteriorly	.70 cm
Thickness of the nasal bone anteriorly	.50 cm
Thickness of the nasal bone posteriorly	1.00 cm
Vertical diameter	8.50 cm
Lateral diameter	5.60 cm
Lateral curvature in 16.00 cm.	.20 cm
Upward curvature in 18.00 cm.	.25 cm
Bibliography—later.	

Plate I.

Showing the ventral surface of the maxillaries and nasal bones, exposing the baleen surfaces and a large blood vessel path.

Plate II.

Fig. 1.—View of the cross-section looking forward, revealing the relation of the maxillaries, premaxillaries and the nasal bones.

Fig. 2-3.—The longitudinal segment of the ramus showing the slight curvature and the cross-section showing the dental canal and blood vessel foramen.

✓ **The Distribution of *Juglans Californica* Wats**

By Willis Linn Jepson.

The range of *Juglans Californica*, the solitary native walnut of the Pacific Coast and commonly known as California Walnut, is from the lower Sacramento to Southern California according to the more recent books of Californian botany. This statement of range does not well express the true state of the case. There are two centers of distribution, one in the north and one in the south, without connecting localities so far as I have been able to determine. In the north it occurs in the lower Sacramento region, keeping to the banks of the river islands of Andrus, Grand and others, and along streams in the valleys at the western base of Monte Diablo, specifically on Walnut Creek and Lafayette Creek. In the south it ranges from the Ojai Valley southward and eastward along the southern base of the Sierra Madres and San Bernardino range as far East at least as San Bernardino. Mr. Parish tells me its altitudinal range there is 1800 to 4500 feet. Southward it occurs in the Puente Hills according to one of my forestry students, Mr. C. N. Forbes, and in Breda Cañon of the Santa Anas on the road from Fullerton to Chino, according to Mr. C. H. McCharles, this the southernmost locality known to me. "Santa Barbara, Torrey" is a classical locality needing confirmation.

There are fine trees on adobe soil near Covina, associated with Sycamore and Live Oak. Thirteen trees in this locality selected by Miss Rea Elliott measured 4 1-6 feet to 8 2-3 feet in circumference near the ground. One may see this species to advantage in the Hollenbeck Pass on the way from Covina to Spadra. Near Azusa the trees are frequently cut down, but stump sprout freely according to Miss Harriet Smith. The same observer notes that the small trees (10 to 15 feet high) in sandy soil in the Sierra Madre foothills bear galls whilst trees in adobe soil do not seem to be so affected.

The trees of the two regions, the northern and the southern, differ somewhat. All fruits from southern trees which have come to me are small, about 3-4 to 1 1-4 inches in diameter. The fruits of the northern trees are larger, about 1 1-4 to 1 1-2 inches in diameter. The two forms also appear to differ somewhat in foliage, the northern trees having longer and broader leaflets. In the south there are two habital states; an arboreous form in creek bottoms or on banks, and a bushy several-stemmed form on cañon sides. In the north there is only the bottom-land arboreous form.

Watson published *Juglans Californica* in the Proceedings of the American Academy of Arts of Sciences, vol. 10, p. 349, 1875. He includes in this species the var. major Torrey of *Juglans rupestris* Torrey, which extends from Arizona to Texas. Excluding this form and limiting *Juglans Californica* to California it is to be decided which Californian form, the northern or southern, is to be taken as the type. Of California material Watson had before him **Brewer**, no. 65, Sierra Santa Monica and **Torrey**, 1865, Santa Barbara county, and apparently no northern material. Moreover, I think it is evident from a close analysis of the first description that the southern form must be taken as the type Watson had in mind; the first locality indication, "vicinity of San Francisco," being only a parenthetical reference to size. In any event, if one must split hairs, he puts first the term "shrub" which must refer to the southern form.

The northern form was discovered much earlier than the southern form, having been found on the lower Sacramento by the Sulphur Expedition of 1837. It may then be known as var. **Hindsii** Jepson, n. var., the botanist of the Sulphur, Richard Brinsley Hinds, being the first discoverer of the California Walnut.

Lord Kelvin

(Formerly Sir William Thompson.)

If, a month ago, the question had been asked, "Who is the most eminent living physicist?" that distinction would unhesitatingly have been accorded to the subject of this sketch. Prior to 1892 he had achieved his great fame as a scientific investigator under the more familiar title of Sir William Thompson. He earned that fame by his successful labors in many departments of scientific inquiry.

Perhaps his most useful work consisted in reducing to mathematical formulæ the relations between heat, electricity and magnetism on the one hand, and the mechanical work these agencies are capable of performing on the other. The published results of his laborious investigations in this department of science have been of great service in the mechanical arts, as precise data were thus furnished for the development of electric power, and its perfect control for practical use.

Lord Kelvin also made remarkable discoveries in the mathematical theories of elasticity, vortex motion, capillary attraction, and molecular energy. In short, his researches, always fruitful, ranged through a wide domain of theoretical and practical physics.

Born in 1824, he was educated under the eye of his father, Dr. James Thompson, who held the chair of mathematics in the University of Glasgow, but graduated at Cambridge as second wrangler. He then spent but graduated at Cambridge as second wrangler. He then spent a year in the laboratory of the distinguished chemist and physicist, Regnault, at Paris, whence he returned to accept the professorship of natural history in the Glasgow University at the precocious age of 22.

He was of a sturdy physique, and became an enthusiastic yachtsman



and skillful navigator. As his mind enriched everything he touched, he invented an improved quadrant and several marine appliances that have benefited the science of navigation, including a new method of taking deep sea soundings.

In 1849 he contributed a series of papers to the Royal Society on "The Dynamical Theory of Heat," which were epoch-making, as they placed the whole science of thermo-dynamics on a rational and scientific basis. These researches were followed, in 1852, by his remarkable discovery of "The Principle of Dissipation of Energy." It has been summed up by a writer in *Nature*, as follows: "During any transformation of energy from one form into another, there is always a certain portion of the energy changed into heat, and the heat thus produced becomes dissipated and diffused by radiation and conduction. Consequently, there is a tendency in nature for all the energy in the universe, of whatever kind it be, gradually to assume the form of heat, and having done so, to become equally diffused. This gradual degeneration of energy is perpetually going on; and sooner or later, unless there is some restorative power, of which we at present have no knowledge, the present state of things must come to an end."

These conclusions open up some interesting problems. What will be the condition of the universe after all the energy has been dissipated and diffused? Will the molecules stop vibrating? Will the planets and sidereal worlds cease to rotate and revolve? Will matter be gathered in vast aggregations, or be diffused through space in ultimate atoms?

But Kelvin was not a materialist. Life was still, to him, a great and over-mastering mystery, and in one of his papers he used this language: "It seems to me most probable that the animal body does not act as a thermo-dynamic engine in converting heat produced by the combination of food with the oxygen of the inhaled air, but that it acts in a measure more nearly analogous to that of an electric motor working in virtue of energy supplied to it by a voltaic battery." Ah, whence comes that energy which segregates life from all other manifestations of force in nature?

A few years ago, when he published a paper on "The Age of the Earth," to which he assigned a shorter period, (about 30,000,000 years,) than did contemporary geologists, his intimations that there would be a limit of but a few thousand years to its future habitability because of the rapid consumption of the oxygen of the atmosphere, were extensively commented upon, both by laymen and men of science. According to Kelvin's figures, there are about 1130 million of millions of tons of oxygen in our atmosphere, and not one ton too much. On the other hand, there is a total annual withdrawal of about 2,500,000,000 tons, caused by the respiration of human beings and animals, and the combustion of wood and coal fires. Happily this loss of oxygen is being

partially restored from a natural source of supply, for every tree, shrub and tiny blade of grass is an oxygen maker.

Like all men of great scientific attainments, Lord Kelvin was richly endowed with imagination, and his statements were often tinged with poetic fancy. He not only saw with clear mental vision, but he enabled his reader to perceive, with equal cleverness, a molecule, for instance, the one hundred millionth of a centimetre in diameter, colliding with its fellows 5,000,000,000 times in a second, for observed phenomena, coupled with irresistible logic, demonstrates the existence and incessant motion of these infinitesimal particles of matter, and the trained imagination pictures what the mind predicates.

Therefore, although his voluminous scientific papers deal with abstruse subjects, intangible materials, occult forces and intricate mathematical formulæ, he commands a style so lucid and engaging that his works are read with pleasure by any whose tastes lie in that direction. These qualities also made Lord Kelvin a favorite lecturer, and he addressed many distinguished assemblies on "The Kinetic Theory of Gases," "The Functions of the Six Senses," "The Nature of Electrical Phenomena," "The Marvels of Capillary Attraction," and other themes dealing with the mysterious forces of nature.

WILLIAM H. KNIGHT.

Report of the Secretary of the Academy for the First Half Year, 1907-1908

The report of the Secretary for the year 1906-1907 went to print for the Bulletin of that year before the June meeting of that year was held; hence, the meeting for that month is included in the present report.

Being the closing meeting for the year, the reports of the officers and sections of the Academy were read, showing very satisfactory progress in the growth and work of the Academy during the year then closing, which reports were included in the Bulletin of July, 1907. The President briefly addressed the Academy on "Scientific Bodies Abroad," giving a resumé of his observations while visiting scientific institutions in Europe, in 1906. The Academy was also addressed by Mr. B. Fay Mills, on the suggestive topic, "Southern California as a Field for Scientific Research and Human Culture," showing the unsurpassed facilities of this favored spot for promoting all that pertains to the highest development in every department of human progress, and indicating the manifest destiny of this section to be the seat of an all embracing aesthetic culture second to that of no place on earth. After music, very acceptably rendered by Mr. C. A. Faithful, the leading feature of the evening's program was announced as a lecture by President Baumgardt, on "Russia, Her Scientific Men and Institutions." Aided by

stereopticon views of striking interest and surpassing beauty, gathered during his travels in Europe in 1906, the speaker held the rapt attention of the large and appreciative audience for more than an hour, while he presented the physical, geographical, social, political and scientific phases of Russia's history and present condition. A brief time spent in social intercourse with light refreshments brought the evening and the Academy's most successful year to a delightful close.

No public meetings of the Academy are held in the months of July, August and September.

On August 29th, at a called meeting of the Board of Directors, the Secretary was authorized and instructed to prepare a circular letter to the members of the Academy, setting forth the unselfish purposes of the Academy, its desire to reach the ear of the people for instruction in matters scientific and historical, and its dependence upon the small annual dues of its members to meet the current expenses, and an appeal to the membership to put forth an extra effort to materially increase our numbers during the coming year. It was also resolved that hereafter only two Bulletins should be issued each year—one in January, and one in July, and that earnest efforts should be put forth to make these publications in every way worthy of the Academy.

At the first regular meeting of the current year, held October 7, 1907, the Board of Directors elected twelve persons to membership in the Academy, indicating the good fruit that was being borne by the circular letter that had been distributed among the members.

The Directors also decided that each section of the Academy should be represented in the Bulletin in a leading article on some topic within the scope of its particular work, and that colored plates illustrating the birds and butterflies of California should be authorized.

At the assembling of the Academy Vice-President Knight presided, and introduced the program of the evening by a brief review of the recent occurrences of importance in scientific circles; calling attention to Sir Wm. Ramsey's success in transmuting copper into lithium; to Prof. Le Due's attempts to produce vegetable life; to the renewed interest in Botany, incident to the celebration of the bi-centennial anniversary of the birth of Linneus, the recognized father of systematic Botany; to the unusual interest centered in the study of the planet Mars at this time, during its "favorable opposition," and to the recent appearance of Daniel's comet.

The regular program of the evening was then taken up by Dr. C. A. Whiting, Chairman of the Biological Section, who spoke of the nerve centers and nerve action of the human body. Dr. Whiting gave an interesting and lucid explanation of the nerve system, both in its structure and its functional activity; illustrating his thoughts by blackboard diagrams. He was followed by Prof. George Leslie, head of the science department of the public schools of Los Angeles, who spoke specifically

of the sense organs and the structure and functions of the brain.

Prof. Leslie went very minutely into the various phases of brain activity, and especially of disordered functions; demonstrating the importance of great care in the early life of a child to detect and correct any failure of correct functioning. The lecture was profusely illustrated by stereopticon views, showing the structure of the brain in great detail and the peculiarity of the nerves leading to and from it. Prof. Leslie's talk was but an exposition of the work he and his assistants are attempting to accomplish among the thousands of children attending the public schools of the city.

The several sections of the Academy reported their organization for the coming year, as follows:—

Astronomical Section, Wm. H. Knight, chairman; H. O. Collins, secretary. Biological Section, Dr. C. A. Whiting, chairman; Dr. C. H. Phinney, secretary. Geological Section, W. H. Storms, chairman; G. Major Taber, secretary. The Chairman announced that Carbon would be the subject for consideration at the November meeting.

At the meeting of the Board of Directors, in November, eleven persons were elected to membership in the Academy.

In the absence of President Baumgardt, Vice-President Knight again presided, and announced that at the December meeting the subject of City Parks and Street Ornamentation would be under consideration.

Preliminary to the main topic of the evening, Mr. Wm. A. Spalding was introduced, and read a most interesting and instructive communication from Father Gangoiti, Superintendent of the Weather Observatory, at Havana, Cuba. Mr. Spalding read an introductory note from Mr. H. O. Collins, giving a brief sketch of the work of Father Gangoiti, emphasizing the remarkable accuracy that has characterized his predictions of weather conditions, especially in connection with the destructive Galveston storm and others of unusual violence.

Mr. Spalding followed the reading of the observer's communication with a brief discussion of its contents, illustrating his ideas by diagrams on the board.

A vote of thanks was heartily and unanimously extended to Father Gangoiti for his very valuable contribution to the Academy. The Chairman then introduced Prof. W. L. Watts, for the discussion of the subject of Carbon from the standpoint of a mineralogist. The speaker, with the aid of charts showing the difference between the atom and the molecule, and also the various chemical compounds of carbon, proceeded to treat the characteristics of this most interesting and all pervading element under the several heads of diamond, graphite, coal, charcoal, petroleum, and carbonic acid gas. In these widely divergent forms he traced the identity of carbon as the chief element in each and the sole component of some, giving a clear exposition of the chemical attributes and a striking demonstration of the practical value of carbon.

The discussion was continued by Prof. J. Z. Gilbert, of the department of science in the Los Angeles High Schools, from the standpoint of the relation of carbon to the plant and animal life of the globe. At great length and with scholarly exactness, Prof. Gilbert depicted the numerous and marvelous combinations upon which animal and plant life are dependent, in all of which carbon plays a most conspicuous part. He also showed the utter hollowness of the pretensions recently made to the production of life by artificial chemical compounds; proving all apparent vitality and growth under such conditions to be mere accretions, without the presence of the all-important life germ.

At the December meeting of the Board of Directors seventeen persons were elected to membership in the Academy.

At the opening of the general meeting of the Academy, Vice-President Knight read a letter from Prof. Hale, Director of the Mount Wilson Observatory, transmitting to the Academy two magnificent photographs of the Sun, recently taken at the Observatory, showing the sun-spots with striking definiteness, one picture exhibiting the calcium floculi and the other the hydrogen floculi. Copies of these pictures are to appear in the Bulletin. After delivering a brief but eloquent answer to the question, "What has Science to do with Beauty?" the Chairman introduced the first speaker of the evening, Mr. Edward J. Harper, City Forester of Los Angeles, who spoke fluently and most instructively on the topic of beautifying the streets of the city by planting and cultivating systematically the shade trees best adapted to the purpose. Mr. Harper displayed a remarkable familiarity with his subject, and entered with such spirit and interest into his topic as to carry his audience with him into all the details of his address, which abounded in that which is eminently practical in closest touch with the most aesthetic. At the close of the Forester's address, the Chairman introduced Mr. H. W. O'Melveny, formerly a member of the Board of Park Commissioners, who delivered a carefully-prepared and very valuable paper on the "Functions of Park Development in Beautifying the City." The speaker treated his subject with much breadth of view and in a scholarly manner, showing the large and important part played by public parks in the development of the highest physical, intellectual and moral life of a community, and emphasizing the immense advantage enjoyed by Los Angeles in this respect, especially in the great areas dedicated to park purposes, but not yet rescued from their nature state.

These two addresses, on subjects of such practical local value and interest, were a revelation to those present of the untold possibilities of healthful and attractive ornamentation in our streets and parks, adding immensely to the attractiveness of our city and the pleasure and profit of our people.

MELVILLE DOZIER, Secretary.

Astronomical Section

The Astronomical Section has been holding its sessions at the lecture room at the residence of S. J. Keese, 1509 Shatto street, since the opening of the present season.

At the October meeting interesting facts regarding Daniel's great comet, which arrived at perihelion September 4, were brought out by Chairman Wm. H. Knight. The comet approached within 48,000,000 miles of the sun, about half the distance of the earth from that body, and was consequently subjected to intense heat. Though an object of extreme tenuity, its bulk exceeded that of the sun, and there streamed from its bright nucleus a tail 15 degrees in length upon the celestial vault, but projecting into space a distance of 20,000,000 miles, in a direction opposite that of the sun. Being the brightest of the comets which have visited our northern heavens since that of 1882, it was carefully studied with those scientific aids—the telescope, the spectroscope and the camera, all of which have been brought to a high degree of perfection during the last quarter of a century. As a comet approaches the sun, its frozen, dormant gases are vaporized and enormously expanded, and a fierce internal commotion, chemical and electric, is set up, a violent ebullition takes place, the dissociated molecules appear to be projected with great energy, and are then repelled by the sun's rays, or some electrical or other mysterious force, and the electrons or radiant matter thus set free are sent flashing far out into interplanetary space. The orbit of Daniel's comet approximated that of a parabola, and it moved round the sun with a velocity so great that it may be carried beyond the powerful attraction of that monarch of our system, never again to return to this portion of the universe.

The November evening was devoted to lantern views of a large number of interesting celestial objects, including views of the moon, spectra of the sun, phases of Venus, polar caps of Mars, belts of Jupiter, ring system of Saturn, principal comets of the 19th century, double and multiple stars, and brilliant star clusters.

The complex nature of the multiple star Polaris was shown by diagrams on the blackboard. In the first place there is the well-known telescopic double, the small companion being of the 9th magnitude and having the same proper motion as its primary. Second, Director Campbell of the Lick Observatory,

has ascertained that the primary is itself a spectroscopic double with a period of four days, and a high velocity of revolution round a common center of gravity. Third, these two bodies appear to be moving in a large orbit, comparable to that of Jupiter, round a third massive, dark body, whose existence is inferred from the otherwise unaccountable perturbations of the primary which has alternate motions in the line of sight of advance towards, and recession from, our own system. Finally, the bright companion, immensely more distant, slowly circling in a vast orbit about the other three bodies. Thus the familiar North Star, which to the unaided eye is a single point of light, becomes a double with a bright companion in a telescope of moderate power, then the spectroscope reveals the duplicity of the brighter component, and further research transforms the latter into a triple system consisting of one bright and two dark bodies, and around all three revolves the bright telescopic companion—altogether forming an exceedingly complex quadruple star.

Tree Growth and Sun Spots

The meeting of December 30 was reported as follows in the Evening News:

Exceedingly interesting was the session of the astronomical section of the Academy of Sciences held last evening at the residence of Treasurer S. J. Keese, whose pleasant parlors were thrown open for the occasion. After several views of Lake Tahoe and vicinity were exhibited by Mr. Keese, Chairman William H. Knight introduced Prof. E. A. Douglass of the University of Arizona, formerly assistant astronomer of the Lowell Observatory at Flagstaff, where he engaged in original research work of a novel nature.

Here Professor Douglass became deeply interested in tree growth, as attsted by the annular rings disclosed in cross-sections of giant pins from 300 to 500 years old. By examining the cross-sections of many large logs, the professor was enabled to compare them with each other, and note the fact that all alike showed large growth in the years following rainy seasons, and meager growth in dry seasons. He thus found a sure criterion of rainy and dry years for periods reaching back to the century before Columbus discovered America.

Finally, searching for the cause of that periodicity, he noted the fact that it accorded fairly well with the alternating maximum and minimum sun spot periods, thus bringing out the hidden relations of sun spot activities, seasons of unusual rainfall, and vigorous or feeble tree growth. W. A. Spalding, who has been engaged in noting the correspondence between sun spot activity and seismic disturbances, regarded the discovery of Professor Douglass as a remarkable corroboration of his own views as expressed in a lecture given before the academy several months ago.

B. R. Baumgardt, president of the academy, who has recently returned from Europe, received an ovation from the club. He spoke at length of many of the interesting astronomical relics he had seen in Europe.

Biological Section

The Biological Section of the Academy has started on what promises to be an unusually successful year. The meetings up to the present have been held at the Pacific College of Osteopathy on the corner of Daly and Mission streets, and it is probable that the meetings will be held at this place during the entire year. The attendance has been good, averaging from twenty to sixty each evening. The October meeting was addressed by Dr. C. A. Whiting; his lecture being on "The Smithsonian Institute," at which place he spent considerable time during the last summer. Professor Miller, of the State Normal School, addressed the November meeting on the subject of "Desert Plants." His lecture was especially interesting and instructive. The December meeting was addressed by Professor Gilbert, of the Los Angeles High School; his subject being "Some Pacific Coast Fossils." Prof. Gilbert's lecture deserves much more than passing comment not only because of the interest such a subject excites, but also because of the pains taken by the lecturer to illustrate his subject, with this end in view he brought with him a large number of specimens, the aggregate weight of which must have been much over one hundred pounds.

It is believed that the meetings for the rest of the year will be quite as valuable from an educational standpoint as those which have already been held.

CARL H. PHINNEY, Secretary.

Geological Section

During the months of October, November and December, 1907, the geological section of the Academy met once each month and these meetings were each much enjoyed by all present, and we believe were not without profit to each of us.

On the evening of October 21, this section met at the residence of Wm. H. Knight, when a number of gentlemen were present most of them mining engineers. On this occasion W. H. Storms described the geology of the noted Homestake mine in South Dakota, together with something of its history and development. Following this there was general discussion of the Homestake and ore deposits in general, in which all present took part.

On the evening of November 18, the geological section again met on this occasion at the residence of Mr. S. J. Keese. The subject for the evening was the Yellow Aster Mine at Randsburg, Kern County, California, which was described by Mr. Storms chairman of the section. The Yellow Aster mine is a geological anomaly, and its description is not an easy task, still all present, among whom were a number of ladies seemed

to understand and thoroughly enjoy the subject, particularly the discussion at the conclusion of Mr. Storms remarks.

The latter part of this evening was taken up by Professor W. L. Watts, who gave a short lecture on volcanoes, illustrated by stereoptican views, including several most interesting views of volcanoes in various parts of the world. Mr. S. J. Kees also added to the evening's pleasure by giving a description of the eruption of Mount Pelee, on the island of Martinique, West Indies. The description was illustrated by numerous interesting stereoptican views. Mr. Keese was well qualified to present his subject having visited the scene of that terrible disaster.

On the evening of December 16, at the residence of Mr. Keese, Professor Watts again lectured on the oil and gas yielding formations of Los Angeles and the Puente hills. This lecture was of thoroughly practical interest and the conditions under which oil and gas occur in the territory referred to.

This meeting was attended by about twenty ladies and gentlemen who evinced a most hearty interest in all that was said by Professor Watts, who is the best authority in California on the subject of the occurrence of oil and gas.

All-Inclusiveness of Science

The subject announced for the December meeting of the Academy was, "Beautifying the City." Prior to the meeting a person who had received the notice querulously asked, "What has Science got to do with Beauty?" The following reply was read from the platform, by Vice-President Wm. H. Knight:

"What," it is asked, "has Science got to do with Beauty?" Certainly a pertinent and very proper question. The Academy of Sciences is organized for the purpose of promoting research in natural science, and diffusing a knowledge of its truths. The question implies that the Academy would best serve its purpose by keeping within its own sphere. But those who are familiar with the present trend of human thought and research, realize that the realm of pure science has so extended its borders in recent times that it has become all-inclusive in the scope of its investigations.

Just half a century ago, that master mind of a former generation—Herbert Spencer—put forth the first volume of his marvelous work, in which he classified and summed up all human knowledge, demonstrated the unity of Nature, and affirmed that all the varied phenomena of which the mind can take cognizance, may be reduced to an orderly scientific

sequence, and is subject to the single and inviolable law of Evolution.

Thus, every department of human inquiry, whether it be invisible atoms, or mighty suns wheeling in space; whether simple cells of protozoa, or the involved structure of anthropoid species; whether a co-operating colony of ants, or that complex social organism, a civilized State; whether the dawning mentality of a spider that plans where to spin its web, or the intellectual grasp of a thinker who, shackled to this little island world flying helplessly through the fathomless abyss, yet stands erect, grapples with the problems of the Universe, penetrates their deep mysteries, and proudly enrolls himself a spark of, and a co-worker with, the Infinite; I say that every phase of the myriad facts thus engaging our attention, is classified and filed for reference in the archives of that wonderful museum—the Temple of Science.

But, reverting again to the question, “What has Science got to do with Beauty?” we are reminded of the pregnant phrase of the French philosopher Cousin, who discoursed of “The True, the Beautiful, and the Good.” Note how well it fits this occasion. The True—scientific facts, the basis of all knowledge. The Beautiful—form, color, proportion, all fundamentally dependent on scientific formula. And the Good—that is, the useful and altruistic, the part each one plays in serving others and making them happy.

Science is the groundwork of a piece of rich tapestry; beauty and utility are the interlacing threads of grace and beneficence, investing the matchless fabric with inexpressible charm.

The Constitution of Matter.

A good idea of ions, electrons and the present accepted views of scientific men regarding the constitution of matter, may be obtained from a perusal of a little volume just issued by Wm. Lawrence Woodruff, M.D., under the title “Therapeutics of Vibration.” Dr. Woodruff claims in his preface that “we are now just entering the transition period from the Electrical Age to the Age of Vibration.” Of course light, electricity, the Roentgen ray, and radium, each play an important part in his elucidation of the thesis that “Vibration is the primal law of the Universe.” The author gradually leads up to a medical application of his subject, which, if not convincing, is at least plausible and informing so far as its scientific basis is concerned.—Elwell Publishing Company, Los Angeles.

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